The American horologist and jeweler

ol. 13 JULY, 1946 No. 7

INCORPORATING HOROLOGY THE NATIONAL MAGAZIN

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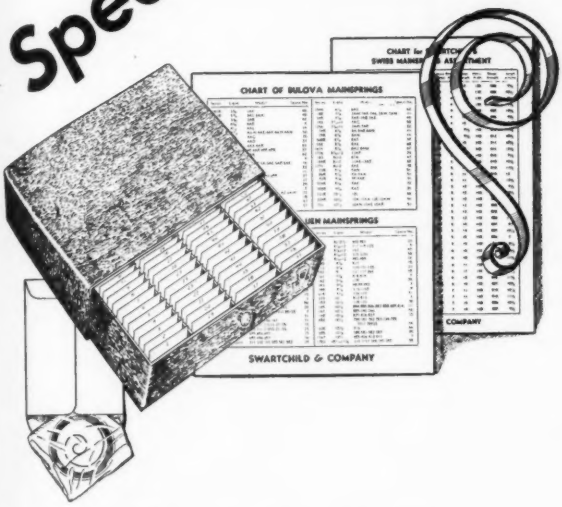

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Volume XIII Number 7

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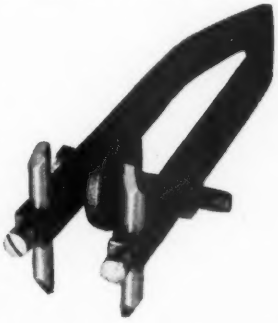

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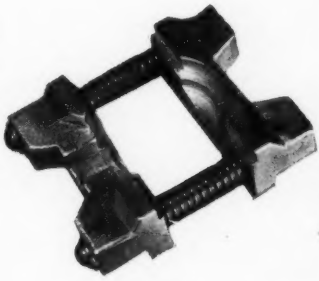

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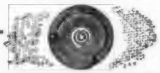
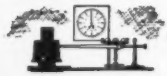
FINE POINTS Who can drill a hole .002 through tempered steel? Or polish a diamond finer than the finest jewelstones? Or weigh a pencil mark, measure a millionth of an inch and measure time to a millionth of a second? Hamilton can. Hamilton research engineers perform these miracles and more in the ordinary course of a day's work. These are the things of which quality and accuracy are made—the very foundation of Hamilton's reputation as America's Fine Watch.



HAIRSPRINGS A fair share of Hamilton's reputation for accuracy is due to the Elinvar hairspring. Not content with forming and finishing its own springs, Hamilton developed its own highly efficient composition for the hairspring material itself, then set up a miniature steel mill and a wire making plant where in final processing the wire is held to .00001 of an inch (with no allowable variation) through the use of special diamond dies which impart a mirror finish.



TIME MICROSCOPE The Time Microscope is a Hamilton-invented instrument for quickly predetermining the performance ratio of a watch long before it reaches the final timing tests. It is an important production tool which makes possible the accurate timing of watches to 1/5th of a second—even when they have no seconds hand. But it is even more important as an illustration of Hamilton's pioneering of many basic horological advances. Patented in 1930, it is the granddaddy of all the audio and visual timing machines in general use today.

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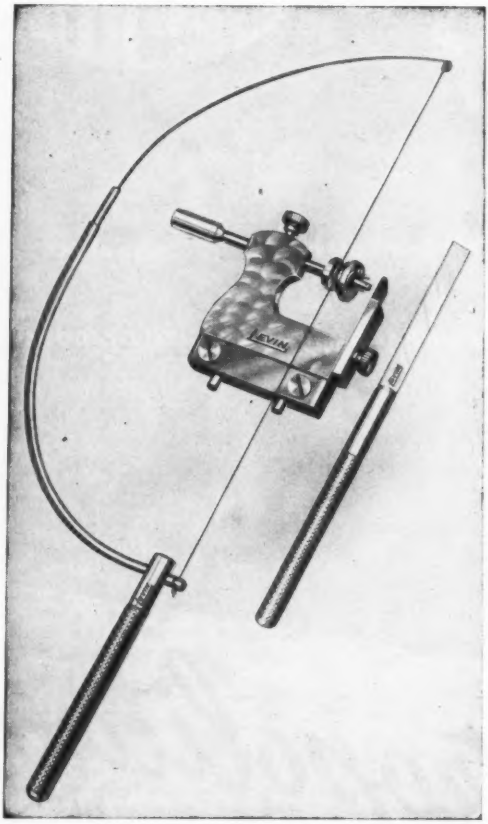

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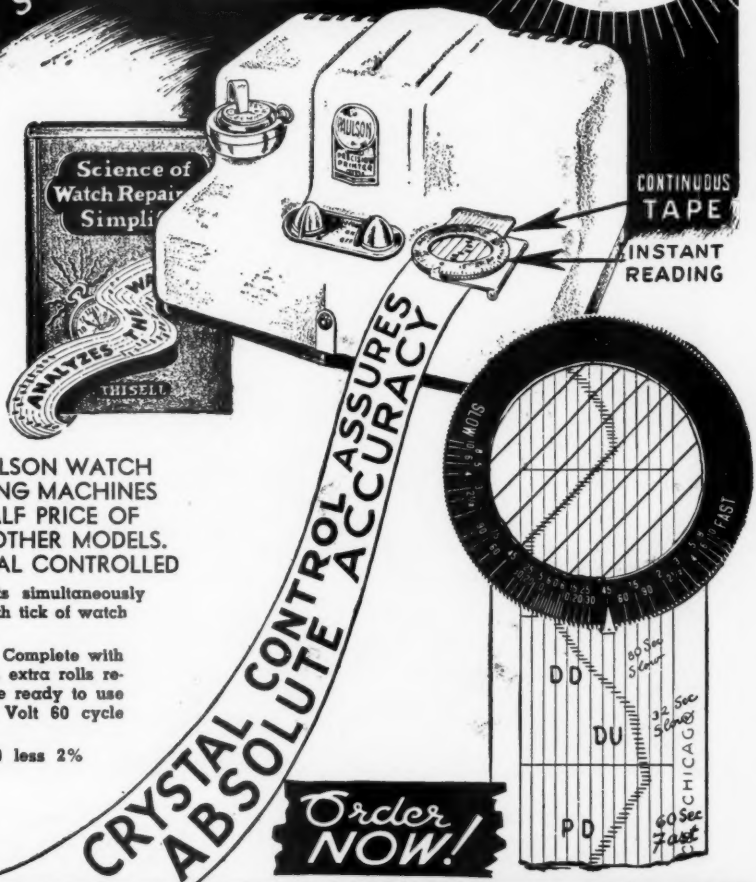

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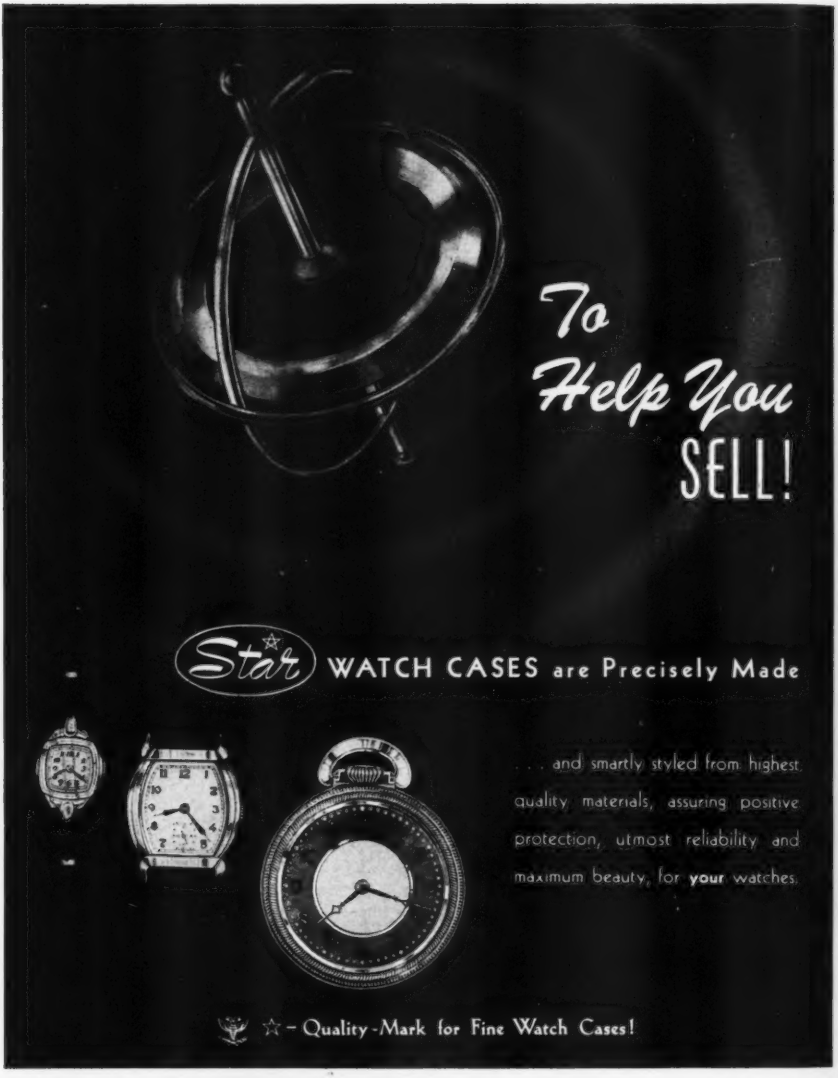
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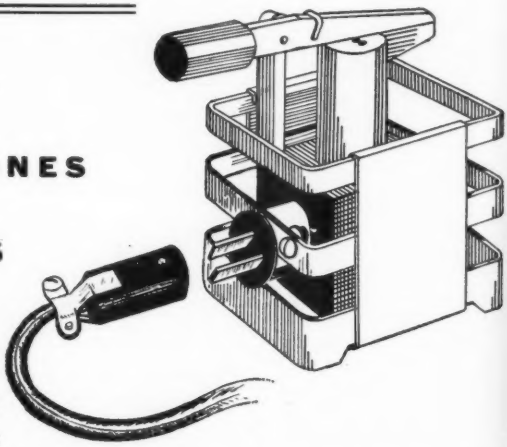

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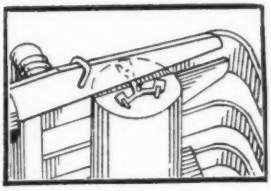
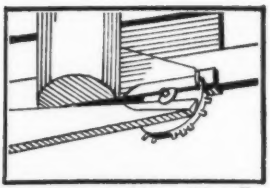


Pallet fork held firmly on heated center post.

For pallet setting, simply plug in to any outlet, and place pallet arbor upside down in small hole on center post. Spring-fork clamp holds pallet fork solidly, so that stones remain square with axis of arbor.



Balance in position with roller jewel upright.

To adjust and set roller jewels, insert balance and lay machine on side. Jewel is in horizontal position. Hairspring need not be removed.

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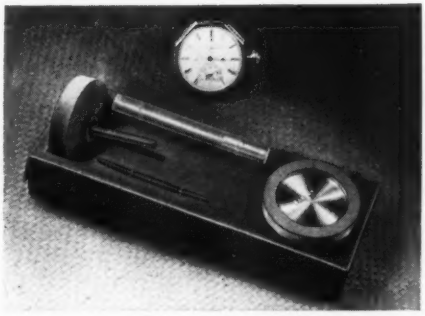

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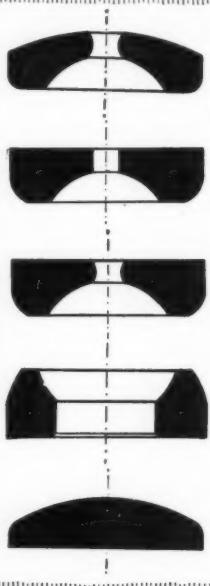

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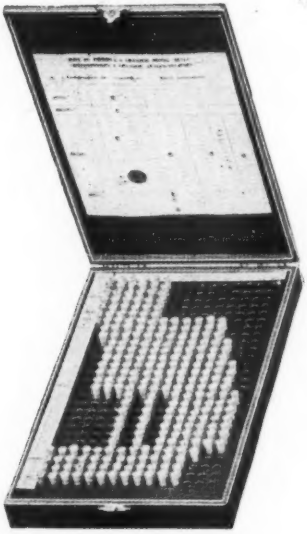

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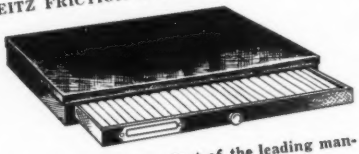

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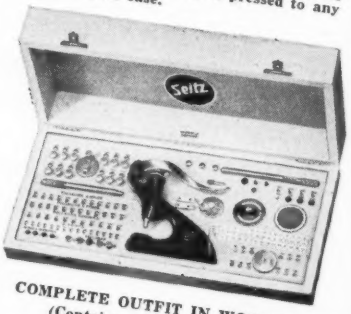

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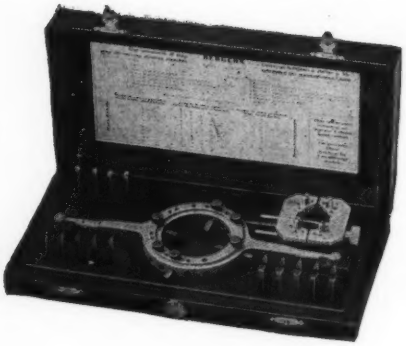

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The American HOROLOGIST and JEWELER
INCORPORATING HOROLOGY

Volume 13 July, 1946 No. 7

Practical Precision in Miniature

Reprinted From the American Machinist, May 23, 1946

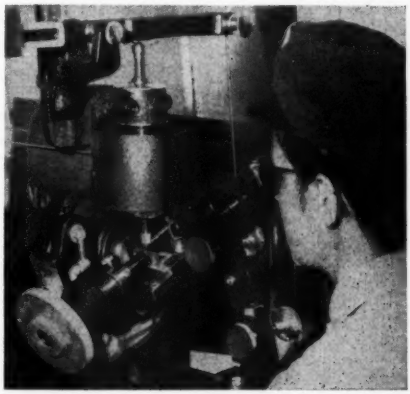
By Harry S. Wharen
Associate Editor

Hamilton Watch, American Bosch and Kollsman Instrument combine to reveal the secrets involved in drilling 0.004-inch holes and tapping 0.008-inch ones to ultra-close tolerances in production.

Holes as small as 0.004 in., just larger than a hair, drilled every day as a regular production job . . . Tapped holes with minor diameters of 0.008 in. and 338 2/3 threads per inch . . . A company specializing in such fine work that one worker, when asked to tap a ½—13 hole, said, "Are taps made that big"

That is precision drilling and tapping. For many years, makers of fine watches have worked to such sizes and extremely close tolerances, but it was only during the war that demand for accurate instruments and other equipment gave impetus to this particular field. To bring you the latest information on this subject, which will grow increasingly important as new machines are designed, as speeds of production and transportation are increased, as the need is felt for more accurate instrumentation, the *American Machinist* has made a survey of practices followed by American-Bosch Corp., Hamilton Watch Company and Kollsman Instrument Division, Square D Company.

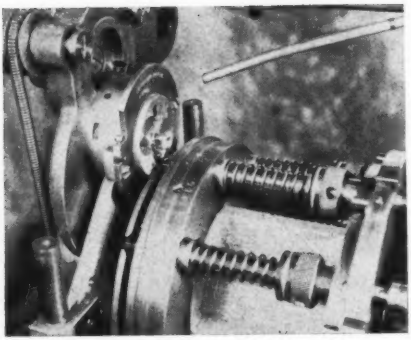
The manufacture of watches, instruments and such items as diesel-engine fuel-injection nozzles not only require working in small sizes but also to tolerances measured in ten-thousandths of an inch and smaller. Close tolerances are necessary, too, as a fuel pump, for example, must measure portions of oil as small as one-tenth of a drop, as many times as 9,000 a minute, and then inject them into the diesel cylinder at tremendous pressure—from 3,000 to 10,000 psi.



Drilling orfices in diesel-engine fuel-injection nozzle. Seven orifices, equally spaced around nozzle tip, are drilled 0.0065 to 0.0073 in. in diameter and at an angle of 75 —30 min. with centerline of nozzle. Free-hand drilling with flat drill, rigid fixture and binocular microscope for good vision hold tolerances.

DRILLING

Drilling of small holes requires certain drills and practices not in general use in larger work. For holes from 0.004 to 0.012 in flat drills offer the best results, wh for holes larger



Pillar plates of watches are spotted in spotting dies and drilled on automatic machines. The drill plate carrying the pillar plate is mounted on two arms controlled by stepped pins in base of machine. Pins position plate correctly as drills index and advance in predetermined sequence governed by cams.

than 0.012 in., both flat and twist drills are used. Holes as small as 0.00025 in. have been drilled with flat drills, but purely as a special rather than as a production job.

Flat drills vary considerably in dimensions according to manufacturer, but usually are made with point angles from 90 to 120°, a slight rake of only a few degrees, a web thickness of approximately 1/3 the diameter and a flute length of 5 to 15 times the diameter. Tolerances on the drills are held as close as +0.0000, —0.0001 in. The larger drills may be ground in fixtures or free-hand on fine-grain wheels, such as Alundum 60M, whereas the smaller ones are ground free-hand on copper laps charged with diamond dust and oil. Accuracy of the drill itself, together with certain precautions in its use, afford tolerances of 0.0002 in. on holes from 0.004 to 0.008 in. and 0.0003 in. from 0.008 to 0.012 in. Above 0.012-in. diameters, tolerances of 0.0004 in. can be held with twist drills.

Precision in small-diameter drilling depends on accurate, rigid spindles, true-running drills, rigid fixtures, and good vision of the work as provided by adequate lighting and microscopes or magnifying glasses. Drilling may be free-hand, with or without spotted parts, or with drill jigs. For small parts, jigs are needed, not only to guide the drills but to hold the parts during drilling. Thus, a part, such as a top bearing plate for an altimeter, would be jig drilled, whereas a fuel-injection nozzle could be held in a fixture on a drill press and drilled free-hand. Higher-production jobs, such as watch pillar plates, can be drilled in automatic machines. A pillar plate, for instance, is first spotted by spotting dies, the included angle of the spots being made less than the drill angle so the drills center themselves on the sides. Both sides are spotted to avoid too many spots on one side and possible distortion of the plate. Then by grouping the holes to be drilled according to size in order to get a surface speed as close as possible to 55 fpm. on each drill, the plate is drilled in a series of operations on cam-controlled machines.

In free-hand drilling, the drill, whether flat or twist, must be true-running to avoid any walking, eccentric holes and drill breakage. Truing of a drill is an extremely important operation and must be done carefully and accurately. On the National Jet precision drillpress, used at American-Bosch for drilling fuel-injection nozzles, flat drills are trued under a 20x binocular microscope mounted on the machine and adjustable to suit the operator. Drills suggested for this machine are hardened from their point up to approximately the middle of the large shank. As the drill is trued by bending the shank, it must be chucked only on the soft part of the shank, that is, with less than half its length in the chuck.

The drill is trued by turning the spindle by hand to bring the drill to its extreme runout position and setting the vertical hairline of the microscope in line with the edge of the drill shank. The spindle is revolved again by hand until the drill shank moves the maximum distance from the hairline. With a small notched screwdriver the drill shank is bent to halve the distance between hairline and shank. By readjusting the hairline

and repeating the bending, the operator can bring the edge of the shank into almost perfect alignment with the hairline as the drill is revolved.

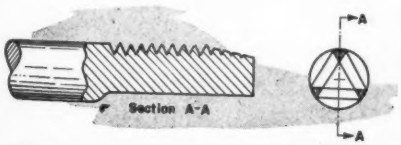
Operating procedure also affects accuracy of the holes. Pressure exerted on a drill should be carefully controlled to maintain tolerance and avoid drill breakage. The crossarm of the National Jet machine, for example, is adjusted until it is horizontal or nearly so during drilling, and the counterweight on the operating lever is positioned to allow the lever to descend slowly with spindle rotating and no pressure applied.

At the instant a drill point touches the work, there should be no pressure exerted on the lever. Any definite pressure at this moment will cause walking of the drill, whereas a perfect spot will result if the lever is properly balanced. Once the spot is made, drill feed should be smooth and steady with an up-and-down finger movement on the operating lever. Each time the drill travels approximately three times its diameter, it should be retracted and brushed with oil.

As with all precision work, both drill and work must be kept clean and it is for this purpose and as a coolant, rather than as a lubricant, that oil is brushed over drill and work. The kind of oil seems to matter little, as long as it has a light body. Light spindle oil or sulphurized cutting oil works well when applied by camel's hair brush or the frayed end of a match or toothpick.

Drill Breakage

Drill breakage can be controlled to an astonishing degree by careful truing and feeding. With a uniform web thickness near the cutting point and an accurately trued drill, there will be little breakage unless the drill strikes an exceptionally hard spot in the metal being drilled. In this case, the drill usually breaks at the fillet between the small and large shanks. If the web thickness is not uniform near the point, the drill is likely to break just above the point and be so difficult to remove from the hole that the part must be scrapped if it is made of steel. If the part is a nonferrous metal, the broken drill can be etched out.

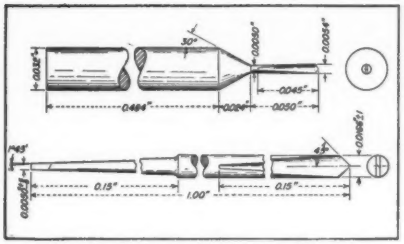


Small watch tap with three flutes ground to bottom of thread. Tap is chamfered over last few threads.

Drilling speeds in general practice increase as drill size decreases. This is true for drills as small as No. 80, which may operate from 12,000 to 15,000 rpm. The smaller sizes of drills, however, give better results on steel parts when speeds are considerably reduced. In an investigation to determine proper speeds, American Bosch operated small drills up to 55,000 rpm., but finally set 2,600 rpm. as the best speed for drills from 0.004 to 0.012 in diameter. At this speed, breakage is negligible with proper practice; and a drill, before wearing dull, can average approximately a hundred holes in SAE 3312 steel with hole depths varying from 0.016 to 0.10 in. This average has been exceeded (in one case a drill having drilled through a total of 14 ft. of alloy steel) but not in general production work. Speeds up to 20,000 rpm. may be employed for brass and other soft metals.

Small holes are checked by wire gages supplied in such lengths that they may be broken or ground off at the end when worn and then advanced in their holders. To hold tolerances of 0.0002 in., Class A gages are needed with tolerances on the Go gage of +0.00002, —0.00000 and on the No Go gage +0.00001, —0.00001. Checking of such gages can be accomplished in Sheffield visual gages and should be set up as a continual operation in the work area.

When drilled parts must be heat-treated, a lapping or cleaning operation follows the heat-treat. Such holes may be cleaned by a revolving wire charged with a lapping compound that removes scale but no stock.



Examples of single- and double-end flat drills with dimensions given to indicate general proportions of such drills

TAPPING

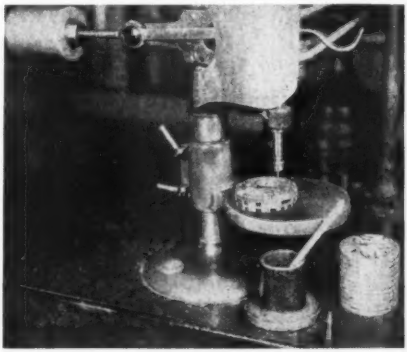
In the tapping of small holes, many of the problems experienced in larger work are encountered, plus particular ones relating only to small work. The size of the taps, especially in watch and instrument work, requires different practices in manufacture and use. The wide variation in thread forms and dimensions used by different companies has so far prevented standardization of tap manufacture and has compelled most users of extremely small taps to make them in their own shops.

Thread Forms

Among the thread forms and sizes used in the manufacture of instruments and watches are the standard American National Fine thread from size 00-96 and larger, AN Coarse thread to a more limited extent, and a variety of special forms and sizes, each manufacturer of such equipment having developed his own pet system. Thus, three leading American watch manufacturers have had three series that resembled one another only in having 60° thread forms. Pitch diameters and pitches varied widely. Hamilton, however, has now adopted a new series based on the Swiss NHS thread but transposed into inch units from the metric system.

In a 3-year investigation, in conjunction with the American Standards Association, thread series of various manufacturers were studied. As it is generally agreed that a geometrical rather than an arithmetical progression is desirable in thread series, they were plotted, diameter against pitch, on log paper to reduce the preferred curve to a straight line. Wide variations and gaps were found in all the series in use in this country, but the NHS series plotted as practically a straight line, therefore was subsequently adopted by Hamilton and is now being used in all new designs. It has not yet, however, been adopted as a standard by A.S.A. Dimensions and tolerances of the series as given in the Reference Book Sheets of this issue.

For thread sizes from 0.0118 to 0.0354 in., or 0.3 to 0.9 mm., the angle of thread is 50° whereas it increases to 60° for sizes from 0.394 to 0.0787 in., or 1 to 2 mm. Pitches vary from 338 2/3 to 63½ threads per in. over the same range, the pitch depending more on space limitations and root strength than on strength of thread.



Free-hand tapping of watch pillar plate is aided by guide plate on which pillar plate is mounted. Cutouts in bottom of guide plate engage a table pin that aligns drilled hole with machine spindle. Cutouts in top of guide plate provide clearance for taps.

To adapt the series to production work, it has been necessary to set up tolerances for the shop to follow. This has been done on the 50° series, the tolerances varying from 0.0006 to 0.0016 in. on major screw diameters, 0.00045 to 0.00120 in. on pitch diameters and 0.0008 to 0.0020 in. on minor nut diameters. Retaining of these close tolerances will depend on their practicability as shown by shop performance. Gaging of the threads may be accomplished by the three-wire method, wire sizes and maximum and minimum measurements over the wires having been established to hold tolerances on the pitch diameter.

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Tap Shapes and Tolerances

Taps for small holes fall into two classifications: those for machine screw sizes for 00-96 and larger, and smaller ones as used in watch and instrument work.

Machine screw taps, based on the American National thread form, are available with cut or ground threads. Inaccuracies in cut threads resulting from warpage and distortion in heat-treating seem to magnify themselves in the tapped work, especially in high-speed tapping. Ground taps, however, are more accurate, as they are ground from stock already heat-treated. Although they are more expensive than cut taps, they will produce many more holes before wearing below size and, as a result, may be more economical per tapped hole. Ground taps are supplied as commercial-ground and in four grades of precision-ground. The principal difference between commercial-ground and precision-ground taps is that the latter are held to closer tolerances on the pitch diameter.

Class 1 and 2 thread fits can be maintained with cut or commercial-ground taps, but for class 3 fits for sizes 00 to 12, precision-ground taps of No. 1 tolerances are generally preferred. Kollsman Instrument Div., however, is producing class 3 fits in general production work with commercial-ground taps.

The number of flutes per tap varies according to size and material being tapped. For sizes 00-96 up to 2-64 or 3-56, two flutes give the best results in all metals, as they provide greater chip clearance. This may be considered as one of the most important factors in selection of small taps. A combination of wide flutes and narrow lands provides maximum chip clearance, but may lead to difficulty in holding close tolerances as the lands afford little support. Narrower lands may be used for tapping soft metals, such as aluminum, copper and brass, rather than for hard, tough metals such as alloy or stainless steels. Flutes of all taps should be made as smooth as possible to allow easy flow of chips and to avoid any clogging that might break the tap or cause it to cut oversize.

For sizes from 2-64 to 10-32 or slightly larger, machine screw taps with 2 or 3 flutes and spiral points are suggested, as they are stronger than standard taps and require less power for tapping. The shear angle on the point may vary from 15 to 20° over a length of 2 to 2½ threads with a chamfer relief of 0.002 or 0.003 in. Wider lands and narrower flutes may be used on spiral-pointed taps as the chips, being forced ahead, will not clog in the flutes on through-hole tapping. The wide lands, however, may cause some loading of the tap in soft metals.

Percentage of Thread

Important as the flute is in its effect on tap breakage, equally important is the percentage of full thread as determined by size of tap drill. Too great a percentage not only requires more power in tapping but imposes greater strain on the teeth of the tap. To avoid difficulty in this respect, Kollsman has set definite standards for machine-screw sizes to fit each material. From 65 to 75% is used for bronze, tool steel, drop forgings, stainless steel, cast steel and nickel copper; 70 to 75% for mild steel, cast aluminum alloys, cast iron and cast brass; and 75 to 80% for wrought brass, nickel, babbitt, wrought aluminum alloys, fiber, white metal and hard rubber.

The extremely small taps, 0.0118—338 2/3 and larger, are made with cut threads and either two or three flat flutes. Two flutes are recommended, as they provide better cutting edges and closer tolerances; three flutes, having less-keen edges, may swell small holes. At Hamilton, the taps are threaded on a watchmaker's lathe, hardened in oil, and fluted and chamfered on a grinder having on its table guide pins arranged to give proper grinding angles for both flutes and chamfer. During grinding, the tap is held in an individual holder which is guided by the table pins as the tap is passed across the face of the wheel by hand. The chamfer may be carried

over 10 to 12, 5 to 6 or 2 to 3 threads as required. Tolerance on the major diameter of the tap is held to +0.0001, —0.0000 in.

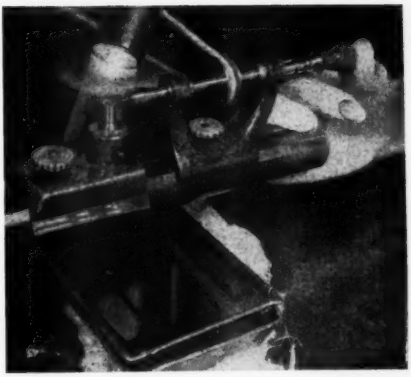
Checking of taps, either machine screw or horological series, is done by the 3-wire method on a super-micrometer or with a dial-gage instrument. Go and No Go thread gages may be checked the same way and should be checked often enough to insure that undersize gages are discarded before parts are scrapped. A floor check is desirable with all gages inspected every 40 hrs. or less and always at every new setup.

Tapping Practice

Little trouble should be experienced in machine tapping if certain requirements are met. First, the tap must be sharp or it will load and dull rapidly. The machine for tapping small holes should be light and sensitive enough to reverse freely, the bearings should be in good condition and the spindle aligned with the table. A machine heavy enough for a ½-in. tap is too heavy for small work, as spindle weight, for instance, may be great enough to cause a small tap to cut oversize. Furthermore, instantaneous reversal is necessary when tapping fine pitches. It is important too that spindle weight and pressure exerted by the operator are not so great as to force the tap, as the result will be a bell-mouth hole and lead errors. A good rule to remember for small holes is that a tap will find its own lead.

Tapping speeds and lubricants also affect the accuracy of holes produced, but vary widely between plants. In one plant all small-hole tapping is done at 1,750 rpm., whereas in another plant speeds range up to 8,000 rpm. At this latter speed, tap feed and reversing are controlled manually with relatively little breakage, but efforts are now being made to develop automatic tapping machines to increase production and cut costs.

Tapping speeds depend primarily on the kind of material, depth of hole, keenness of tap, chip room in flutes and type of lubricant. In the extremely small sizes, taps cannot be operated to provide the surface speed ordinarily recommended with larger taps, but even with these taps as high a speed as practical will afford more accurate results, longer tap life and greater production.



Machine tapping of watch balance wheel at 8,000 rpm, requires light, sensitive machine and light feeding pressures. Careful operation permits tapping of as many as 2,000 holes without breaking tap.

Among the lubricants found successful for use in tapping small holes are a mixture of cutting oil and stearic acid (10 gal. oil to 3 lbs. powdered acid) for aluminum alloys; sulphurized oils for steel and nickel silver; lard oil for beryllium copper; the oil-stearic acid compound; a mixture of lard oil and kerosene or dry for copper and brass; and water or dry for plastics.

Early American Clock Keys

By W. H. Samelius

In the early days of clock manufacturing, the making of clock keys involved a great deal of work, and different clock companies competed, more or less, in designing fancy keys. However, the methods used for designing keys in those days, were quite different than the methods that are employed today. In our modern keys, the grip is punched, the stem is drilled, and the hole is squared by automatic machines. The two parts are then assembled and the key is completed.

The iron key was cast in a sand mold from cast iron. The cast iron keys were then heat treated in hemotite ore or iron scale and subjected to high heat without fusion. This operation

made the iron malleable or tough. The hole was then drilled into the stem, and a square hole formed with a square drift, or sometimes an arbor was inserted in the hole, and the material forged around the square arbor, leaving the hole square. The keys were then finished by means of placing them in a tumbling barrel, where they were tumbled, which tool off the rough edges and smoothed the surface. A fine abrasive mixed with sawdust or ground leather was used for the tumbling operation.

Watchmaker Licensing And Rehabilitation

By B. W. Heald

National Legal Advisor

About ten years ago I was one of the group of watchmakers in Wisconsin actively selling the idea of watchmaker licensing to the watchmakers and jewelers of the state. Since that time we have had over nine years of operation of our watchmaker licensing law. Now is a good time to look back and determine some of the benefits from such a program. Watchmaker licensing has proven to be the only method so far found, of assuring the public that the watchmaker standards are adequate, and secondly, assuring to the individual watchmaker that his standards also are adequate and to assure him of being a competent and successful watchmaker.

There is today no problem more important to all of us as Americans than the problem of assisting the returned veteran to adapt himself and to fit into civilian life. It is on just such a program that the licensing of watchmakers shows great advantages. In our state we now have a program of apprenticeship training which actually provides for every apprentice a well rounded horological education. We have done this throughout the state and included every apprentice watchmaker. A competent watchmaking instructor hired by the State Board of Vocational education through the cooperation of the local Vocational School travels the state giving just that theoretical and practical help that is so important to the watchmaker trainee. This plan assists the apprentice employer by relieving him of the of the training skills and theory that burden of giving to his apprentice all is necessary. Anyone who has had apprentices knows that it is quite a problem to work out a well-rounded training program to assure full training, if you must resort only to the day to day problems that come up in our shops.

States without watchmaker licensing cannot begin to hope to have such a training program. In fact, the apprenticeship system in general is in ill repute among watchmakers throughout the nation because of its many weaknesses. Those weaknesses, however, are solved when you have a compulsory training program with a supervised instruction and training followed by an examination.

We have an obligation to the returned veteran. That obligation is not to assist him to go into a trade inadequately prepared, but rather to assure that he has all the training necessary to make the adjustment to civilian life which is more difficult than we civilians realize.

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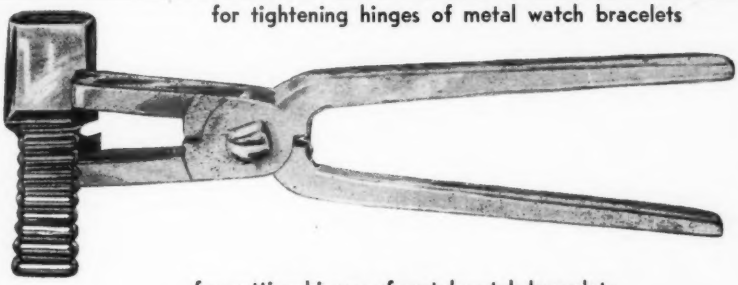

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Wisconsin Retail Jewelers' Association

(Editor's note: The following article is part of an address given by President Ralph H. Young of the Wisconsin Retail Jeweler's Association, before the 40th Annual Convention of that body, and reprinted in the May issue of the Wisconsin Jeweler.)

"My report on the results of the watch repair price survey must have been somewhat of a disappointment. I know there are some who would have liked to go home with a scale of prices that would be standard with most of us. I would have liked that myself, and I wish I could have provided all the answers to this perplexing problem. The survey did show the only thing it possibly could—that is the average charge made for the various items considered.

"To begin with, let us look at the first item on the survey cards, "Overhaul, (cleaning, etc..)." Some of those who returned the card do not seem to like the term "overhaul." They crossed it out and left just "cleaning, etc." The term "cleaning" surely does not begin to describe the operation. It is not used at all in many shops, and more and more are definitely avoiding the term. To your customer, it means a simple operation such as washing a car. Take your car to the garage and tell him "just clean it," and what do you get?

"True, the parts are thoroughly washed as part of an overhaul job. All dirt, tarnish and old oil is cleaned from all of the parts, but before that part of the job can be done, the watch must first be disassembled (at least it must be in Wisconsin—see Wisconsin Statutes No. 125.08 (4). No small degree of skill is required in this rather minor operation either, but it's **time** we are primarily concerned with right now, and this part of the operation definitely justifies a charge varying with the intricacy of the watch.

"Check the time required for this phase of the job in your own shop. See how much time is actually spent on taking down the watch and determining its condition and needs through proper examination. You may be suprised at what you find.

"Consider the watchmaker's time as worth $3.00 per hour. That's not at all out of line with the other crafts most all of which require a degree of skill and training far below that of a watchmaker. Now take the average of between three and four watches, which is definitely given by authorities as the productive capacity of an A-1 watchmaker doing first grade work, and you will receive on an 8-hour day $24.00 on the basis of four watches a day.

"The **minimum** average pay for a watchmaker taken from figures I obtained from the heads of schools and others in authority is $60.00 for a forty-hour week. That you will see, is $1.50 per hour, or, at a charge of $3.00, you are getting about the same mark-up as you would on a watch. Only, out of your $1.50, you must pay for the cost of material used. Check your books—the costs as they appear for watch repair material against the gross from watch repairs, and I think you will find it runs something like 20%, or, in dollars and cents, 60c of that $1.50 you have left after the watchmaker's salary, or, except for the share of operating expenses such as light, heat and space, you have a net of 90c per hour from your $3.00 per hour charge.

"Your charge of $3.00 per hour amounts to 5c per minute. At that rate. if ten minutes is spent disassembling and examining a watch, you are entitled to make a charge of 50 cents for this very preliminary stage of the job.

"Let's follow that through now and take the various steps needed to arrive at the point where all parts and the watch is ready to be assembled. The several phases of the operation will run something like this:

Disassembling, examining, estimating needed repairs	10 min.
Polishing balance pivots and similar repairs	10 min.
Truing and poising balance wheel	20 min.
Washing and cleaning operations	10 min.
Examining, pegging pinions and jewels, assembling balance jewels	10 min.

"That will total 60 minutes, and at the rate we are considering, it is worthy of a charge of $3.00.

"You are now in a similar position to that phase in a factory manufacturing watches where a lot of parts are on hand, ready to be assembled and actually made into a watch. You, too, have only a lot of parts to be put together and made into a watch.

"This may take you all the way from twenty minutes to an hour or more if you have to adjust the escapement or hairspring action to get a satisfactory rate. So the assembling and finishing will average another hour if you are really interested in delivering a first-class service job to your customer.

"At that rate your minimum charge for an overhaul job where no part replacements are required is going to have to be $6.00 if you want to show a $7.20 gross profit on your $16.80 investment."

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The Science of Horology

By Orville R. Hagans and D. L. Thompson

Basic Mechanics—Lesson 4
(Continued From June, '46)

25. The Millimeter Gauge

A millimeter gauge, shown in Fig. 16, is often used by the horologist for taking measurements of parts. Its scale is based on the metric system of measurements of lengths, which was developed as the need for an international system of measurements became imperative. The unit of length in this system is the meter, which is equal to the ten-millionth part of the distance from the equator to the North Pole.

The metric system of measurements is a decimal one, the meter being divided into 10 decimenters; a decimeter into 10 centimeters; and a centimeter into 10 millimeters. Or, one meter equals 1,000 millimeters; one decimeter equals 100 millimeters; and one centimeter equals 10 millimeters.

The scale is divided into 10 centimeters, these being numbered from 1 to 10 in both directions, and further divided into 100 millimeters. The sliding jaw, Fig. 16, a, is arranged so that measurements can be made between the jaws a and b, as in measuring diameters and lengths; between the points of the jaws at c, as for measuring the thickness say of a mainspring barrel bottom; over the outside of the points at d, as for measuring say the inside diameter of a mainspring barrel; and, with the sliding jaw moved to the other end of the scale, between the end of the gauge and point e, for measuring lengths of staffs, pinions, etc.

When measuring over the jaw points marked d, two millimeters must be added to the reading of the scale as the width of the two points is two millimeters, the true reading of the scale being between the jaws.

The small scale on the sliding jaw, which is called a vernier, is provided for measurements in tenths of a millimeter. This scale consists of 9 millimeters divided into ten parts. With the jaws closed, the line marked 0 on the large scale coincides with the line marked 0 on the small one. If the sliding jaw is moved so that the second line on the small scale is in line with the second line on the large scale, the space between the jaws then measure .1 millimeter. If moved so that the third lines on each scale coincide, the space measures .2 mm, and so on, until when the tenth line on each scale is in alignment, the space measures one full millimeter. Further movement of the sliding jaw would divide the second millimeter in the same manner, etc. To retain a measurement on the gauge, the sliding jaw can be locked in position with the locking lever, f.

The millimeter gauge is handy for making ordinary measurements, where a plain pair of calipers would do as well, but its smallest measurement is .1 mm, which is much too large for fine work for which there is need of a gauge that will measure to .01 mm.

In the previous articles in these lessons, we have used the English and American inch as the unit of measurement. This unit of measurement is as good as any as it can be divided into 10th, 100ths, 1,000ths, and 10,000ths just as readily as any other arbitrary one, and micrometers so divided are in use in most, if not all, of our finest industries, where tolerances are kept to closer standards than in most other countries. However, most of the other nations use the metric system and to avoid confusion many of our industries are changing over to that system as a standard.

In the following text, all measurements will be stated in millimeters, and if the student wishes to convert them into inches, he has only to divide them by 25.4 which is the approximate number of millimeters per inch. The

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exact equivalent of a meter in inches is 39.37039.

26. The Metric Micrometer

As much of the Horologist's work is fitting parts of extremely small dimensions, he has need of a gauge that will accurately measure them. The metric-micrometer, shown in Fig. 17, meets his requirements nicely in making measurements, such as diameter, thickness, and length, of parts or portions of parts.

The body of this gauge, Fig. 17, a, is made of a heavy U-shaped bar of steel, and points, b and b, between which the measurements are to be made, are of hardened and tempered steel. The pitch of the screw, which controls the movement of the movable point, is .5 mm, and, therefore, one turn of the knurled nut, c, will separate the points .5 mm. The scale on the barrel, d, is usually marked in full millimeters, although some are marked in .5 mm also, and two full turns of the nut will be required to separate the points 1 mm. The nut is marked with 50 divisions, so 1/50 of a turn (one division) will separate the points .01 mm (1/50 of .5 mm).

To read the scale of the micrometer shown in the illustration, count the number of full divisions showing on the barrel and then read the fraction, or decimal part, of a mm. from the number of the division on the nut which is nearest in alignment with the straight line on the barrel. Thus, the scale shows the separation of the points to be five full mm. on the barrel and five divisions on the nut, which is 5.05 mm.

In using this gauge to measure an inside diameter, say of a mainspring barrel, it is necessary to first measure this diameter with inside calipers and then measure the spread of the calipers. To measure the thickness of a section of a part, say of a recess in a watch plate in which the points of the gauge are too large to fit, a short length of metal can be inserted between the part and the movable point and an overall dimension taken, after which the length of the piece of metal is to be measured and this deducted from the overall dimension. It is important to use a light touch in adjusting the points in making measurements. They must not be screwed up tightly against the part being measured, but just so that they touch lightly. The reason for this is that there is a small amount of back-lash of the screw in its hole to permit it to turn freely. If the points are set tightly against the work being measured, the back-lash is taken up and when the points are removed from the work they will move closer together by a very small amount, say of several thousandths of a millimeter. Another reason is that the U-shaped body of the gauge would spring slightly and when the points were removed from the work the body would spring back to normal. This would balance up the back-lash of the screw to a certain extent, but not equal it. Such care in adjusting the points is, of course, only necessary in making the finest of measurements.

The student is advised to secure one of these gauges, of good make, as its convenience and dependability more than justifies its cost.

27. Turning, Grinding, and Polishing Cylindrical Pivots

An important part of the horologist's work is the turning, grinding, and polishing of cylindrical pivots, called square-shouldered pivots, which are used on the arbors of the train wheels of watches and clocks.

The student has been made familiar with the shapes of most of the turning tools or gravers to be used and how to keep them sharp, which is most important if one expects to do good, fast work. The correct and incorrect positions of presenting the graver to the work are shown in Fig. 18. The correct position is shown in the figure at a, in which the point of the graver is presented directly to the center of rotation of the work. The tool-rest should be set close enough to the work to prevent the possibility of the graver being drawn between them, which would either break the point of the

graver or spring the work out of true rotation.

If the graver is presented to the work perceptibly above the center of rotation, as shown in the figure at b, it will not cut but will merely burnish the metal and dull the point. If presented perceptibly below the center, as shown at c, it will cut too deep which will either break off the point or spring the work out of true. A graver will cut, after a fashion, if presented only slightly above or below the center of rotation of the work, but only with the attendant risks of spoiling the work.

The graver should be provided with a straight wooden handle of about 15 mm in diameter and 10 cm in length, in which a hole has been drilled centrally to such a depth as to allow only 3 cm of the graver to extend. It is to be held in the hand, in the same manner as holding a file, with the thumb placed close to the hand, which will give perfect control of the movements of the point. It should not be held in the manner used in holding a pencil, as control of the point is difficult in this case.

For first practice in turning, several cylindrical sections should be turned on brass rod. Place a rod of 5 mm in diameter in the number 50 chuck and allow it to extend for one centimeter (10 mm). Starting at the end, present the graver to the work in the manner shown in Fig. 19, which presents the point only, or as shown in Fig. 20, which presents the point and a small portion of the side, and turn roughly to a cylindrical section of 4 mm in diameter and 9 mm in length, after which the whole of the side may be presented to the work, as shown by the dotted lines in Fig. 20, and the irregular surface shaved down. Use a micrometer to check the diameter so that the turned section will be of the same diameter throughout its full length. This operation forms an oversize pivot, the shoulder of which should form a perfect right angle to the cylindrical section. To square up the

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shoulder, the graver is held in the position shown in Fig. 23 and at an angle to the work so as to slightly under-cut or dish the shoulder, after which the graver is held as shown in Fig. 22 and the cylindrical section continued to the face of the under-cut, thus removing any excess of metal or root in the angle and making a clean, square shoulder.

Next, measuring from the end, turn a cylindrical section of 3 mm in diameter and 5 mm in length, and square the shoulder as before. Then turn a section of 1 mm in diameter and 2 mm in length and square its shoulder.

This work should be continued on brass rod until perfectly cylindrical sections with square shoulders can be easily turned, after which the same operations should be practiced on iron rod until they can be done without difficulty.

Having mastered the above work on brass and iron, the turning of tempered steel can be taken up, which is more difficult and requires very sharp and hard gravers. Select a piece of staff-wire, which is tool-steel wire ready hardened and tempered to dark blue, or prepare a piece of mill-rod by hardening and tempering it to dark blue, of 2 mm in diameter and place it in a number 20 chuck, allowing it to extend for 5 mm. Turn a perfectly cylindrical section of .5 mm in diameter and 1.5 mm in length, square the shoulder and slightly under-cut it. Round the end, as shown in Fig. 23, and bevel the shoulder, as shown in Fig. 24. The beveling is done to reduce the diameter of the shoulder and thereby its friction with the plate or jewel, and to prevent grit from getting between the shoulder and the plate, which would reduce the necessary end-play of the arbor. The diameter of the shoulder should be only slightly greater in diameter than the pivot.

Correct and incorrect pivot lengths are shown in Fig. 25. The correct length is shown at a, where the end of the pivot comes nicely through the hole. The pivot shown at b is too short and will wear to one side of a brass hole, making the ledge shown which reduces the required end-play of the arbor and prevents free action of the wheel. That shown at c is too long, and causes difficulty in assembling a watch or clock movement.

As the graver makes fine lines in the work, which under high magnification appear as ridges and valleys, the pivot must be ground to nearly finished size and then polished to reduce friction in the hole in which it turns. A pivot can be ground acceptably with an iron grinding slip and oilstone paste. A little of the paste is placed near the end of the slip, which is held under the pivot, as shown in Figs. 26 and 27, and moved back and forth endways for about 3 cm, with light pressure and slow and measured strokes, while the work is turning at moderate speed. To start, hold the edge of the slip against the shoulder of the pivot, and give the slip a slight side to side movement as the grinding progresses, replacing the paste between the slip and the work as required.

(To Be Continued)

Horological Institute Of America

Report of the Annual Meeting, June 17 and 18, 1946.

PROGRAM

Sunday, June 16th, 8 p. m.—Meeting of the Executive Committee, preliminary to the General Meeting, at the Raleigh Hotel, 12th St. and Penn. Ave.

Monday, June 17th, 10 a. m.—Opening of the Annual Meeting by President Frank D. Urie. Greeting by Dr. R. G. Harrison, chairman of the National Research Council. Presentation of the following papers:

1. The Relation of Balance Poise to Watch Performance. Dr. C. N. Challacombe, Elgin National Watch Company.

2. The Hairspring and Balance Assembly of the Hamilton Marine Chronometer. E. W. Drescher, Hamilton Watch Company.

3. Film — Manufacture of Jewel Bearings.

4. Tentative Standard for Instru-

ment and Watch Screws. D. R. Miller, National Bureau of Standards.

LUNCH

5. Time and the Railroads. Thomas D. Pyne, Interstate Commerce Commission.

6. The U. S. Naval Observatory Time Signals. Paul Sollenberger, U. S. Naval Observatory.

7. The Crystal Clock. Vincent E. Heaton, National Bureau of Standards.

8. Educational Film—Howard L. Beehler, Dean, Bulova School of Watchmaking.

4:00 p. m.—Report of the Nominating Committee and election of members to the Advisory Council. Meeting of the Advisory Council for the election of officers.

8:00 p. m.—Visit to the U. S. Naval Observatory.

The papers were all very interesting as well as educational and the films presented pictorially some of the fine mechanical processes required of the trained watchmaker. The visit to the Naval Observatory in the evening was enjoyed by about fifty of the members, who were shown through the Time Service Division of the Observatory and given an opportunity to view the stars through a large 26-inch telescope.

Following the completion of the lecture program, the nominating committee presented the following names for election to the Advisory Council. All were unanimously elected, for a three-year term: Francis R. Bentley, Chicago, Ill.; Howard L. Beehler, Chebague Island, Me.; John J. Bowman, Lancaster, Pa.; Leon E. Clarke, Syracuse, N. Y.; Herbert C. Holt, Philadelphia, Pa.; Edward H. Hufnagel, Mt. Vernon, N. Y.; Alfred S. Rowe, Indianapolis, Ind.; L. D. Stallcup, Nashville, Tenn.; Frank D. Urie, Elgin, Ill.

For one year to complete the term of Fred G. Gruen who died during the year—George T. Gruen, Cincinnati, O. For one year to complete the term of Dr. W. H. Kenerson, resigned—Dr. Frederick M. Feiker of the National Research Council, Washington, D. C.

(Continued to Page 46)

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Wm. L. Bloom
30 W. 47th St., New York 19, N. Y.

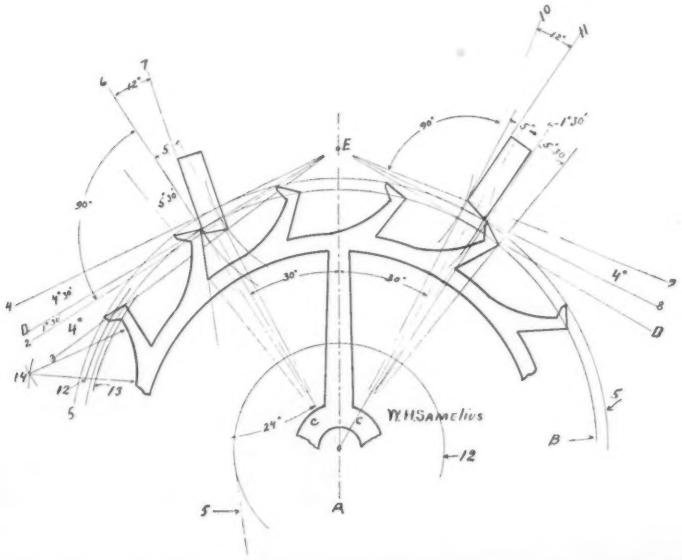
Drawing of 15 Tooth Escapement

By W. H. Samelius

Draw a center line A thru the center of the paper, strike a circle 230 MM in diameter. This will be the primitive diameter for escape wheel (B). The wheel is to have 15 teeth and to determine the position of pallets or escape angle, divide the circle of 360 degrees by 15, this will give us 24 degrees from tooth to tooth, or the width of space between teeth. As the pallet is to embrace two and one-half spaces, multiply 24 degrees by 2½, the result being 60 degrees for the position of the pallet stones. This 60 degree angle is divided by two, allowing 30 degrees on both sides of the center line (C). Draw these lines. Next, locate the pallet center. Erect a perpendicular line from the escape angle "C" and tangent to the primitive diameter of the wheel. Where this line crosses center line "E" will be the center of the pallet arbor. A perpendicular line is also constructed on the opposite side of the wheel which will cross the center line at "E". These two tangent lines are D and E.

As we have 24 degrees space between the escape teeth, 12 degrees are used on each side for width of tooth, width of pallet and drop. The twelfe degrees may be divided thus: 5 degrees 30 minutes for width of tooth, 5 degrees for width of pallet stone and 1½ degrees for drop. As this drawing is to be for a circular escapement, the escape angle passes thru the center of each pallet stone. As the pallet stones are to be 5 degrees wide, layoff two and one-half degrees on both sides of the escape angle running radial lines to the center of the wheel. Then to the left side of the receiving pallet, lay off 5½ degrees for width of tooth, running a radial line to center. From the full width of the discharge stone, lay off 1½ degrees on the primitive diameter, running a radial line to center. This will be the drop. From this drop line, continue laying off 5½ degrees for the width of tooth. These dimensions are all made on the primitive diameter of the wheel "B." This will complete dimensions for circular motion of wheel.

As most escapements are planned to allow an angular motion to the lever of 10 degrees, these 10 degrees are divided between the lift on the pallet,



the lock and lift on tooth, we will allow 1½ degrees for lock from the tangent line "D". This line is below the tangent line No. 2. Continue with another radial line from pallet center 4 degrees below line No. 2. This will be for lift of pallet, line No. 3. Above the tangent line, run a radial line thru pallet center of 4½ degrees. This will be the lift, or angle for escape tooth, line No. 4. By striking a circle where the inside width line of receiving pallet and the outside lift 4 intersect, scribe a circle. This circle will then represent full diameter of wheel No 5.

From center "E" or pallet center, strike two arcs, passing thru where the width of the pallet stone and primitive diameter of wheel intersect, showing path of pallet stone. The lifting angle for the escape tooth and pallet can now be inserted for the receiving side of the escapement. Between the width lines for the tooth, 5½ degrees and from the primitive to full diameter of wheel, draw in top of tooth. Then from the lower lift line No. 3 where the pallet crosses the arc and the lower lock line (2) will be the face of the pallet stones. From the toe of the escape tooth, lay off a clearance angle of 24 degrees, taken from the radial line passing from the toe of the tooth to the center of the escape wheel (5). From the receiving corner of the receiving pallet stone, erect a perpendicular line (6) continuing to the right of this perpendicular line, lay off 12 degrees (7). This line will be the position of the pallet stones and the draw or draft to hold the lever against the banking screws. The full width of the stone may now be determined. Where the inside arc traced from the pallet center intersects line 2 will then be the full width of the pallet stones. A parallel line to the draft angle of 12 degrees may now be drawn and the length of the stone completed. The length of the stone may be 3 to 4 times its width. The discharge stone now can be placed. Extend a line from pallet center, passing thru the outside width of the

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pallet stone and full diameter of the escape wheel (8). It is at this point where the escape tooth leaves the pallet. From line No. 8 extend a line from pallet center 4 degrees wide. This will be the lift of pallet stones (9). Then the face of the pallet will fall between the two arcs and the width line. Again erecting a perpendicular line from the receiving corner of the discharge stone (10) and continuing from this line 12 degrees to the right we again have a draft angle for the discharge stone (11). A parallel line to the draft angle from where the outside arc of pallet stone and full diameter of the wheel intersect will give the full width of pallet, which can be cut off square for length or corresponding length of receiving stone. The tooth that has been passed thru the discharge stone can now be placed. The face of the tooth can now be placed which falls between the two width lines and the primitive and full diameter of the wheel (Circle B and No. 5). The rest of the escape teeth can now be placed. Divide the distance on the primitive diameter of the wheel from the toe of the receiving side of the tooth to the toe of the discharge side of discharge tooth. The space between these points is divided into three equal spaces. This will locate a toe for each tooth. The length for top of tooth may be taken from the first two drawn and the same dimensions apply to the rest of the teeth. The depth of the tooth is more or less conventional. Ordinarily the depth of the tooth equals one-half the distance from tooth to tooth taken on a full diameter wheel. A construction circle is drawn from the escape wheel center and tangent to the 24 degree clearance angle. (Figure No. 5). It is now easy to complete the front of remaining teeth as they will all be tangent to this construction circle.

There are several designs for back of escape tooth, however, whatever the design is, it must be such that there is no possibility of a corner of the pallet stone striking or meeting with interference when the stone enters between the teeth. The drawing shows the most common design of the back of escape tooth.

The following suggestion will give proportions that goes to make a pleasing looking wheel. The width of the rim may be equal to one-sixth of the distance from tooth to tooth. The diameter of the hub may be 1/5th full diameter of the wheel. The wheel is to have four arms and the width of the arm at the rim may be equal to the width of the rim and increasing one-third in width towards center.

To design the back of the tooth, divide the space between the primitive and full diameter of wheel (Circle 5 and B), Line No. 12. Then, inside of circle B add another circle of equal space (13). Then between the two outside circles (12 and 5) run a short radial line for the heel of the tooth. On circle 13 lay off one-half the length of impulse face of tooth and connect the short radial line to this point on circle 13. This will be the underside of the club and the neck of the tooth. Divide the space from the front of each tooth on the root diameter or outside of rim and mark off all points the same amount, then span the compass to a radius equal to the distance from toe to toe of teeth and from the neck of the tooth, or circle 13 and to the point on the rim, strike a short arc for back of tooth (14). Provisions for slide are not shown. If slide is to be shown on the drawing, one-half degree may be allowed. The slide may be taken from the total lock of 1½ degrees which would allow 1 degree for lock and one-half degree for slide, leaving a total lock of 1½ degrees.

H.I.A. Report

(Continued from Page 43)

After election of the above members to the Council, the Council met and elected the following officers for the coming year: President, Frank D. Urie, Elgin, Ill.; first vice-president,

Alfred S. Rowe, Indianapolis, Ind.; regional vice-presidents, Herman B. Pedrick, Philadelphia, Pa.; Howard S. Schrantz, Cleveland, O.; S. George Cochron, Nashville, Tenn.; Allen C. Roberts, Anaconda, Mont.; George J. Wild, Peoria, Ill.; Louis Levin, Los Angeles, Calif.; treasurer, Edward H. Hufnagel, Mt. Vernon, N. Y. Additional members of the Executive Committee: John J. Bowman, Lancaster, Pa.; Leon E. Clarke, Syracuse, N. Y.; Milton Manby, Lancaster, Pa.

Because of the small attendance on Tuesday, the regular business meeting was combined with the meeting of the Advisory Council. R. E. Gould continued as Executive Secretary, and the Council agreed to try to find an assistant treasurer to relieve the treasurer, Mr. Hufnagel, of some of the burden of his duties. The secretary was also authorized to secure additional help as needed for clerical assistance.

Authority was given Alfred S. Rowe to secure office quarters for the Journal in Indianapolis, and to purchase the necessary furniture. S. R. Douglas was continued as editor and was authorized to secure full-time clerical and stenographic help.

The report of the Committee on the certification of Horological Schools granted to five well known schools, recommended by the Committee. It was understood that the investigational work of the Committee is to continue and that more schools may be added to the certified list as the investigation progresses. The first group of schools to be certified includes: 1. Elgin Watchmakers College, Elgin, Ill. 2. Bowman Technical School, Lancaster, Pa. 3. Bradley Polytechnic Institute, Horological Department, Peoria, Ill. 4. New York State Agricultural and Technical Institute, Department of Horology, Morrisville, N. Y. 5. Arthur A. Hansen Trade School, Watchmaking School, Waltham, Mass.

The Committee was instructed to have appropriate certificates prepared for presentation to the above schools.

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3. For notched or indentation types reverse wrench and use pin side, either 3 or 4 end as needed.
4. After determining which end to use, loosen brass nut ¼ turn, turn large disc, with thumb on outer knurled edge adjustment in or out until lugs fit watch snugly. Then tighten nuts, hold wrench firmly on case and turn to open.

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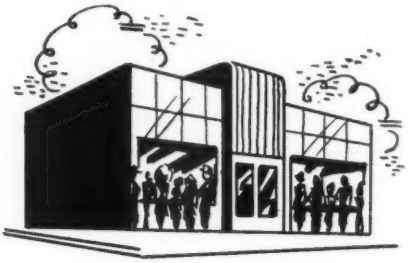


Maryland Jewelers Operate In 'Fifth Avenue Manner'

Lednum's Jeweler's which has been in the process of remodeling since November 1st, 1944, brings to Cambridge, Maryland, a truly modern and up-to-the-minute jewelry service, in the Fifth Avenue manner. The entire plan was designed and drawn by it's owner, Mr. C. Noble Lednum, who has waited long to put his ideas into concrete form. With the purchase of a building August 9, 1944, it became possible to put his dreams into reality.

A new black and ivory glass front, by Pittsburgh Plate Glass Company's architect, Mr. John H. Hershan, features sandblasted name and coat of arms in the ivory glass over the front header, and also on the glass transom above the seven-foot wide Herculite glass, which is three-quarters of an inch thick is framed in genuine red mahogany, and affords a full street view of the entire store. Green tile and tan granite with a green tile diamond set in the center form the entrance walk way. Exceptionally high, four show windows 46" above street give an eye level view to window shoppers. Scientific Holophane Flush Ceiling lights are used in these front display windows which are made entirely of genuine mahogany with one step up floor. Optionally, colored velvets will be used to change the appearance of windows and displays as in the past, this being a Tiffany idea which has proven very successful. Front window lights are operated by a Tork Time Clock.

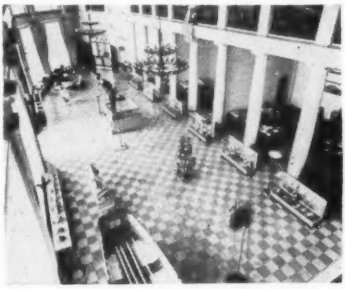
Across the rear a lower mahogany partition with three built in display cases with upper closure of polished Pittsburgh Plate Glass in which hand and speak holes have been cut and ground, divides the office

and repair shop from the store yet is completely visible at all times. To the left is the Service Department; to the center and right is the Office. In center rear is a built-in vault by Allen Tyler & Sons who also built the furnace and air condition unit room in the rear of service department and office. Five jack plugs make phone connections available throughout the store. A storage and stock room runs the entire length of the building, including the lavatory, unpacking department, and wrapping department. A freight entrance on Gay Street with indicating signs takes care of incoming and outgoing freight. Carpentry work has been in charge of Mr. Ted Detamore. Electric wiring was done by Mr. Walter W. Mobray.

Mr. and Mrs. Lednum are ably assisted by Mrs. Eugene Creighton, Miss Nicey Brooks, Mrs. Rosalie Hansen, and Mr. Post.

L. Luria & Son, Inc. Opens Miami, Florida Branch

Joseph J. Luria, president of L. Luria & Son, Inc., the Silver House, New York, has announced the opening of a new southern branch in Miami, Florida, to house offices serving from the Miami branch. The building, located at 400 S. W. Second Ave., Miami, is one of the outstanding hollow tile buildings in the city.



The showroom itself, of over 7,000 square feet, was built of Italian marble and is of the finest Southern architecture. The storage and shipping facilities consist of close to 15,000 square feet.

Business operations, with complete wholesale distributor lines, commenced on June 1st.

In accordance with practices adhered to by the Luria organization in New York for 50 years, the management has adopted the sales policy of selling to dealers only. The area served from the Miami branch will consist of the southern part of the United States.

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Information Please . . .

Directed by
W. H. SAMELIUS, *Chairman,*
Science of Horology & Technical Advisory Board

GMH: Can you give a combination of wheels and pinions for a Grandfather Clock with a very slow pendulum? Pendulum is about 4 or 4½ feet long.

Answer: To construct a clock with a pendulum such as you wish to employ, I suggest the following train:

Main wheel to have 144 teeth, center pinion 12 leaves, center wheel 96 teeth, third pinion 12 leaves, third wheel 90 teeth, escape pinion 12 leaves and the escape wheel 25 teeth. This combination will call for a pendulum 56 3/10 inches long and will beat 1 2/10 seconds per swing of pendulum.

The following is also a combination you may use: Main wheel 120 teeth, center pinion 10 leaves, center wheel 80 teeth, 3rd pinion 10 leaves, 3rd wheel 75 teeth, escape pinion 10 leaves. You could also use a 25-tooth escape wheel. This will employ the same length pendulum 56 3/10 inches long.

Different pendulums can be used if you follow the following formula, using the same train as called for above:

Escape wheel teeth	Vibrations per hour	Length of pendulum
25	3000	56.3 inches
26	3120	51.8 inches
27	3240	48.1 inches
28	3360	44.7 inches
29	3480	41.4 inches
30	3600	39.14 inches

The only pendulum that will show seconds is the 39.14-inch pendulum. All others will beat slower than a seconds beat, and consequently will not indicate seconds on the dial. The 56.3-inch pendulum swinging at 1.2 seconds per beat will swing 50 times per minute and the seconds bit, or dial, will have to be calibrated into 50 marks instead of the regular 60 marks. It is understood that whatever escape wheel you may select, a special pallet will have to be made for that particular wheel.

HGE: Can you give any standard for side shake and end shake applicable to railroad watches?

Answer: In general practice, the following shakes are used:

	End Shake	Side Shake
Center pinion	.02 mm	.015 mm
Third pinion	.02 mm	.015 mm
Fourth pinion	.02 mm	.015 mm
Escape wheel	.02 mm	.01 mm
Pallet arbor	.015mm	.0075mm
Balance staff	.02 mm	.0025mm
Barrel	.02 mm	.015 mm
Barrel arbor	.02 mm	.015 mm

SHW: How can I determine the proper size drills to be used before threading a hole?

Answer: To determine the proper size tap drill for any tap, divide 1 inch by the number of threads to the inch. If your tap is not marked, you will have to count the threads. The result will be: pitch, or distance from tip of one thread to the tip of the next. Then multiply the pitch by .649. This will give depth of thread. Multiplying depth of thread X 2 will give depth of two threads or the amount to be subtracted from full diameater of your tap.

RHS: I am told it is not necessary to poise a balance wheel after fitting a new staff if the wheel is well trued in round and flat. Is this true?

Answer: Regardless of how well you true the balance wheel, it should be tested for poise as you have no assurance that the wheel was in poise before you fitted the new staff. When poising the balance, the roller table is attached. In all first class shops, poising the balance is a "must." Your reputation depends on how well the watch runs after you have repaired it and no watch can keep close time in different positions unless the balance is in poise. That is your first step for building your reputation. After that, the hairspring must be perfectly centered, leveled and its development in and out from center equal in all directions. It doesn't take a customer very long to discover his watch is keeping better time after the watch has been repaired by a workman who will poise the balance and correct the hairspring.

JOC: How can a person tell the time from the bells of a ship's clock?

Answer: The striking mechanism of a ship's clock is constructed so as to strike 8 bells at 12 o'clock, 4 o'clock and 8 o'clock. The clock strikes each hour and half hour and one bell is added each half hour until 8 bells are reached, when the clock once more strikes one bell again, thus:

At 12:30 strikes Ding.

At 1:00 strikes DingDing.

At 1:30 strikes DingDing-Ding.

At 2:00 strikes DingDing-DingDing.

At 2:30 strikes DingDing-DingDing-Ding.

At 3:00 strikes DingDing-DingDing-DingDing.

At 3:30 strikes DingDing-DingDing-DingDing-Ding.

At 4:00 strikes DingDing-DingDing-DingDing-DingDing.

4:30 to 8 and 8:30 to 12 o'clock, same as above.

RCB: I want to build a decimal clock showing 100 minutes to the hour. The 4th pinion is to turn 100 revolutions to 1 revolution of center wheel; instead of the 60 revolutions of 4th pinion and 1 revolution of center wheel. Will you give me the combination of teeth and leaves of pinion necessary?

Answer: You can use the following combination: Center wheel to have 80 teeth, 3rd pinion 8 leaves; 3rd wheel, 70 teeth and 4th pinion 7 leaves. Or any two reductions where the ratio is 10 to 1, suitable for the space allowed between centers.

YAM: Can you give formula for determining the correct driving weight for a Graham Dead Beat escapement, having seconds beat pendulum?

Answer: There is a formula for making these calculations which would give you the approximate weight. However, there are many factors entering the problem to be met up with, such as the size and condition of pivots, the bearings in the plate and condition of the gearing which all have something to do with the free running of the train. So, instead of going into mathematics to get results, the quickest and best way would be to suspend a container at the end of your cord and gradually fill container with buckshot or sand until you have enough power to drive the escapement. Then, continue adding weight until your escapement shows some slide. It is an easy matter then to weigh container, using the same amount of lead or cast iron for making up finished weight. The brass tube filled with lead of equal weight will then fill your requirements.

APO: Can you tell me anything about the Mozart Watch Company?

Answer: The Mozart Watch Company was founded in 1864 at Providence R. I., and capitalized at $100,000. It was to manufacture an unusual watch having three wheels, invented by Mr. Mozart. After two years, the model was discontinued and a regular model watch designed by L. W. Cushing of Waltham. The name of the company was changed to New York Watch Company, and the plant was destroyed by fire in 1870.

JGD: Quite often, after cleaning a watch, I find the hairspring coils have a tendency to stick together. I test for magnetism but none is apparent. Can you suggest what might be the reason for the coils sticking?

Answer: You state there is no magnetism in hairspring. Can it be possible the cleaning solution is old and also the rinse? In time they become impregnated with oil, then as the parts go thru the drying operation some of this thin film of oil is left on the hairspring, becoming sticky and causing the trouble. If your cleaning solution is in good condition, the rinses fresh, you should have no further trouble.

RMcC: I have trouble setting roller jewels. I have tried shellac and other cements but somehow the roller jewel becomes loose and falls out of the roller. Can you advise what the trouble may be?

Answer: After selecting roller jewel of proper size, it should be dipped in alcohol to thoroughly clean the surface. The roller table should also be thoroughly cleaned, removing any other shellac or cement. Then when setting a new roller jewel, use new cement or shellac, not applying any more heat than is necessary to cause the cement to flow freely, as the cement will then adhere to the dry surfaces. Overheating the cement will cause it to become hard and brittle and lose its adhesive qualities.

GAG: Which is the better and quicker method for grinding pivots to size—oilstone powder, corrundum powder or diamond powder?

Answer: We prefer to use a very fine grade of oilstone powder and oil, using an iron grinding slip for grinding the pivot to size. The oilstone powder will not imbed itself into the balance pivots, which is liable to happen if you use carborundum or diamond powder. Pivots that become charged with either of these two abrasives will soon cut the balance hole jewel and cap jewel.

RWT: I find when working on some 7-jewel Swiss watches, that shortly after oiling them the pivots appear to be dry and when testing the watch on a timing machine, it shows very irregular and spotted lines. After re-oiling the watch, letting it run for some time, and testing the watch on timing machine, I find the lines are cleared up. I am curious to know if the plates are porous, absorbing the first application of oil.

Answer: The writer has heard of some research work along this line, experimenting with porous metals. You no doubt are aware that the auto industry uses self-oiling bearings for special parts of its power unit. The metal is made of very porous material being filled with special lubrication under great pressure. Bearings thus treated will remain lubricated for a long period of time and it is possible you have run across some watch plates that have porous material. Naturally, when you clean the watch, what lubrication was in the holes was absorbed. It will require an extra application of oil in order to fill the pores in the metal.

JOC: Will you enlighten me on meantime screws, and how much regulation one can expect when turning them in or out from the balance wheel?

Answer. The balance wheel contains three kinds of screws—the large screws are the balance screws, the smaller head screws such as half head or quar-

ter head are the timing screws, and the screws with the long thread and square head are the meantime screws used for final regulation.

When fitting a new hairspring, it is sometimes necessary to add a small amount of weight, such as a quarter head, or even a pair of heavy washers to bring the watch close to time, say within two minutes. It is then the meantime screws may be used to bring the watch to correct time. This is done by turning the meantime screws in or out. Turning them in will cause the watch to run fast and the reverse when turning them out.

When using the meantime screws, be very careful to turn the opposite screw an equal amount, otherwise the balance will be put out of poise, destroying position rates. The use of these meantime screws should not be abused, turning them out too far so they may be loose or strike other parts of the watch. The following table will give you the approximate results you can expect from the average watch.

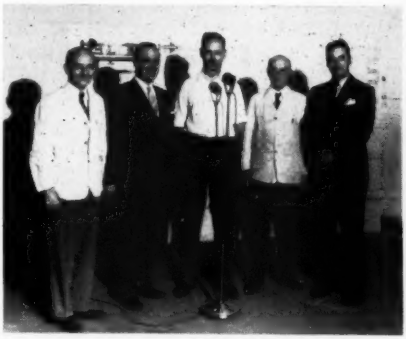
Size	Turns of screw	Sec. per hr.
18-16	1 full turn, 2 screws	3 seconds
12	1 full turn, 2 screws	2 seconds
6/0	1 full turn, 2 screws	5 seconds
18/0	1 full turn, 2 screws	5 seconds

Watches employing four meantime screws should only be turned one-half the amount shown on the chart for the same results.

Lord Raglan, wounded at the Battle of Waterloo, calmly said, "Don't carry away that arm till I have taken off my ring!"

U. H. A. A. Legal Advisor Visits Denver

Combining Colorado vacation pleasure and furthering plans for the first post-war Convention of the United Horological Association of America, Ben Heald, National Legal Advisor of the UHAA, was in Denver the first week of July.



Left to Right—Emanuel Seibel, Dean of the American Academy of Horology; Orville R. Hagans, President and Technical Director; Ben Heald, National Legal Advisor, UHAA; A. O. Hagans, Manager of School Materials and Supplies; and Sam Hale, Superintendent.

Meeting with National Secretary, Orville R. Hagans, and other National Officials, tentative plans for the first Convention in five years were discussed. A number of possible Convention cities were mentioned, and dates suggested, but other than assuance of a National conclave scheduled for the later part of this year, no definite plans were released.

Highlighting his visit here, was an address by Mr. Heald, to the entire student body of the American Academy of Horology. He stressed the value of an academic horological education, and the excellent opportunities available to them in the accredited schools, and the wisdom and neccessity of finishing their courses!

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Complete Stock Bulova, ETA, Font, AS, Benrus, etc.
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G. S. Flexo and Fulton Watch Crystals.

HARRY NEST 33 John R. Street Detroit 26, Michigan

Hampden County Watchmakers Guild No. 5

The members of the Hampden Guild No. 5 of Springfield, Mass., and their wives visited the Hartford, Conn., Guild on June 19, 1946. A supper was served at the Hedges, in Hartford, which was attended by fifty persons. Following the supper, violin selections were presented by Mr. Ston of the Hartford Guild, which were enjoyed by all. Mr. Montmeny of the Springfield Guild entertained the group with piano selections. Mr. Forcenel of Springfield completed the entertainment by rendering two vocal selections.

The Springfield Guild is arranging a meeting with the Worcester Guild to be held in Brookfield in July. At that time plans will be made for state legislation for 1947.

Arthur R. Price,
Secretary.

Tallahassee Horological Guild

The March meeting of the Tallahassee Horological Guild, was an interesting and informative one. Members visited a local industrial diamond cutting company. The Foreman gave a brief outline of the entire diamond cutting process, from the mining of the rough stones, to the finished product. He also demonstrated the cutting of industrial stones and how it differs from the cutting of gem stones.

The April meeting was somewhat similar to the March meeting. The entire group of members was escorted through a vocational training machine shop by the engineer in charge, who explained the making and care of machine tools.

At the June meeting, President Roy Fite led the discussion on new tools which are being placed on the market, and a new pivot polisher was exhibited. Plans were discussed in regard to the new watchmaking licensing law which the Florida Guilds hope to present to the new State Legislature. This law, if enacted, is for the purpose of licensing all watchmakers for the protection of the public.

Charles Schannep, a former member of the guild, was welcomed back from duty overseas with the Navy. He was a watchmaker on the repair ship U. S. S. Black Hawk.

E. F. Dean,
Secretary.

Towel City Watchmakers Guild

The Towel City Watchmakers Guild held a meeting on June 26, 1946, at which time its members witnessed a demonstration of the electric recording Watchmaster. President F. C. Jordan of China Grove, presided over the meeting.

The demonstration of the Watchmaster was presented by Chuck Southerland, and Dick Lester of the S. La Rose Company of Greensboro.

Four new members were accepted at the meeting. They were: Rowland Chapman and George H. Safrit of Kannapolis, Paul Currin of Concord, and Harold D. Trexler of Gastonia.

The July 16th meeting of the guild was featured by a chicken dinner at Mirror Lake in Salisbury. In the future, regular sessions of the guild will be held on the third Thursday night of each month at 7:30 P. M. at the Y.M.C.A., in Kannapolis.

Color in diamonds is due to small amounts of impurity in the carbon.

DIALS TIME THE WORLD

WATCH DIALS

Dials Refinished ike Original
Radium Applied
Prompt Airmail Service
Excellent Workmanship
PRICES REASONABLE

Dials Manufactured
LARGE STOCK
OF POPULAR BRANDS AS
FONT. 6¾x8" 120
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Wisconsin Watchmakers Association

The Wisconsin Watchmakers Association Convention, held recently, proved to be highly successful. One-hundred and fifty-one persons attended a luncheon given by the Milwaukee Wholesale Jewelers Association.

Colonel Henschel, of the Bulova Watch Company, and Howard Beehler, delivered interesting, illustrated talks. These were followed by a report by Ralph Young, regarding the survey of retail watch repair prices. No definite conclusions can be stated as yet, but his program is most interesting.

The following officers were elected by the Wisconsin Watchmakers Association: Richard R. Meissner, Racine, president; Hans Jensen, Racine, vice-president; C. G. Anderson, Milwaukee, secretary; Joe Soltis, Milwaukee, treasurer; Mac Guretzke, Milwaukee, national trustee; Warren Te Ronde, Milwaukee, technical director.

B. W. Heald.

Horological Association Of Iowa

(The following is a form letter that was mailed to the more than 800 watchmakers in the state of Iowa, by Mr. G. Y. Swartzendruber, Secretary-Treasurer of the Horological Association of Iowa.)

Dear Fellow Watchmaker:

The Horological Ass'n. of Iowa represents the Watchmakers of Iowa. It was this association that gave time and effort in supporting the legislation which enacted the Watchmaker's License Law. It is felt there are flaws in this license law, and correction will be made from time to time as advisable. However, as the law now stands, it is a step in the right direction towards the improvement of the watchmaking craft.

Legitimate and conscientious Watchmakers have spent years in study and in perfecting their talents. It is these Watchmakers who are entitled to all the benefits from the License Law. As a member of the Horological Association of Iowa, it is possible to receive even more benefits, thus raising the standards of workmanship among the Watchmakers of Iowa. A progressive Watchmaker is always eager to improve his own work, which in turn makes for more satisfied customers. As time goes on the reputation of a good jewelry store will be in part, the reputation as to workmanship of the Watchmaker.

Membership in the Horological Association of Iowa gives you membership in the United Horological Association of America, with much worthwhile information from the monthly publication of the American Horologist magazine. This Journal is devoted exclusively to the interests of the Watchmaker. You may not feel this is true, but these are the days for holding old watch repair customers and attracting new ones. A capable Watchmaker can do both.

The dues for membership are only $8.00 a year, which includes membership in the Horological Association of Iowa, and the United Horological Association of America. Members are entitled to all the rights and privileges of both Organizations.

The Horological Association will meet at the same time the Iowa Retail Jewelers meet for their annual convention Sunday, September 29th in Des Moines.

Enclosed find application blank—don't hesitate—send dues today to the Secretary.

Respectfully yours,
G. Y. SWARTZENDRUBER,
Sec'y-Treas.

Marcasite became popular for jewelry during the reign of Louis XIV. when anything that glittered was sought by those who could not afford real jewels.

Perfect Lubricants for All Small Mechanisms

FULCRUM OILS

Can't gum—spread—or corrode the pivots. Will not evaporate—contain no acid—are not affected by temperature—have perfect viscosity for use indicated.

Your jobber has it—or can get it

FULCRUM OIL CO. FRANKLIN, PA.

Watch Oil—Bracelet Watch Oil—Clock Oil—Chronometer Oil
(Established 1912)

Introducing

Flourescence Test Identifies Doublets and Triplets

Of considerable interest to the jewelry industry is the announcement from the research staff of the Gemological Institute of America that it has found fluorescence to be an excellent means for the rapid identification of doublets and triplets. This method is especially helpful in the average laboratory, because it can be used on a large number of gems simultaneously.

In a series of tests in the G. I. A. laboratory, seventy-five doublets, triplets and glass imitations were placed under ultaviolet radiation of a wave length of approximately 2,500 Angstrom units. Results were negative under other wave lengths.

Triplets were immediately revealed by the fact that the colored cement layer fluoresced strongly, giving off a very light greenish yellow hue that showed up as a bright line encircling the stone. The fluorescence failed to appear only in the case of quartz-topped and quartz-backed triplets with a green cement to imitate emeralds. Apparently the cement used was of the type not excited to visible light by ultaviolet radiation.

Garnet and glass doublets proved immediately distinguishable by the fact that the glass base fluoresced a strong greenish-yellow, no matter what its color in ordinary light, while the garnet tops stood out as a dark non-fluorescent area above. Here again it was found possible to make the test on a large number of gems at one time, combining speed with certainty.

According to the G. I. A. staff, the 2500A radiation is especially valuable not only for the doublet and triplet test but also because of the other gem-testing applications in which ultra-violet light of this frequency range can be employed.

General Electric Presents New Mantle-Type Clocks

BRIDGEPORT, CONN.—The Rhapsody, the Maestro and the Concerto, three new General Electric mantle-type clocks, are now being shipped in limited quantities, R. O. Fickes, manager of the company's clock division, has announced.

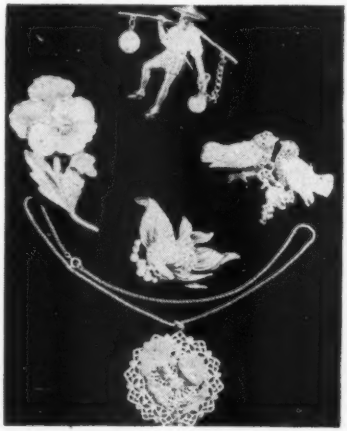
Each of the three new models has a mahogany case, a quiet and efficient G-E mechanism and full Westminster chimes which strike each quarter hour.

The mantle chime clocks are self-starting and their precision motors are sealed in oil.

The Westminster chimes featured on the three models are classic and are said to be based on a theme from the opening of Handel's Symphony, "I know that my Redeemer liveth." The chimes were first fitted into the tower clock of the University Church, St. Mary's the Great, in Cambridge, England, and were later reproduced on a large scale in the Victoria Tower Clock of the House of Parliament.

Porciflex Sprayed Costume Jewelry

Sprayed with Porciflex, jewel-toned high-grade baking enamel, these gay pieces of costume jewlery have an indestructible finish that can't crack, peel or chip.



Developed by the H. V. Walker Company of Elizabeth, New Jersey, Porciflex cuts production costs almost 50 per cent by reason of its fast-drying qualities. Once baked, it is impervious to acids, oils and alkalis, and has a minimum tendency to discoloration.

Many manufacturers making costume pieces for teen-agers which must withstand extra hard wear have found Porciflex the perfect answer to their problem.

The low cost of finishing these pieces enables manufacturers to introduce new models to the market with greater frequency, an important factor when a teen-age buying public is being considered. In addition, the bright, high gloss colors of Porciflex make these enameled pieces more effective as counter display pieces.

Rustproof 'Sports' Binoculars

Compass Instrument and Optical Company 268 Fourth Avenue, New York 10, N.Y., is introducing all-metal design, rustproof "Sports" Binoculars to retail at about $10.00. These binoculars are equipped with matched negative eye-piece Gallilean magnifier type lenses, 3½ power 40 mm optically ground and polished. They come in an attractive black wrinkle finish with all-metal parts tarnish-proof. Each pair of glasses comes with sturdy, snap-fastener carrying case and six foot shoulder strap. Height: closes - 5¼"; open - 6". Weight complete: 18 ounces.

Roto-Sho Electric Display Turntables

General Die and Stamping Company of 262-272 Mott Street, New York City reports that production has been resumed on its ROTO-SHO Electric Display Turntables which for many years have been the basis for a major portion of the revolving merchandise displays seen in store windows.

The postwar model illustrated which operates in 110 Volts A.C. is a sturdy, all steel unit, built to carry a load of from a few ounces to 200 lbs. turning three times a minute. It is supplied with an 18" table, and the height is less than five inches overall.

ROTO-SHO has always been a favorite because it is an all-purpose turntable, and attractive displays can easily be built on it whether the services of a professional display man are available or not.

Until material shortages ease the company will concentrate on the one model, but plans to add other items to its display products line within the near future. These will include build-up fixtures especially designed for use with the turntables.

A catalog page describing ROTO-SHO Electric Turntables is available and will be sent upon request.

Hyprez Diamond Compound

The superior performance of diamond powders in many finishing operations is well known. Hyprez Diamond Compound is a new prepared abrasive containing only finely graded, pure diamond powders of excellent quality in a scientifically developed vehicle, combining this singular superiority with ease and full control of operation.

To assure uniform and most economic performance on the job, Hyprez Diamond Compound is available in a large variety of grades each readily identified by a distinguishing color. The compound is furnished in clear Pyrex cartridges which fit into syringe-type applicators. Full protection from dust, dirt and grit is assured, and metered amounts of the compound are easily applied to the work in a flat, economical ribbon. No special skill or special tools are required.

Hyprez Diamond Compound is marketed by the Engis Equipment Company, 431 South Dearborn Street, Chicago 5, Ill., and the Sapphire Products Division of the Elgin National Watch Company, 932 Benton Street, Aurora, Ill.

NYE'S WATCH AND CLOCK OILS

100 years of skilled research in precision maintenance has developed highly specialized NYE'S WATCH AND CLOCK OILS. Dependable lubrication for the smallest watch mechanisms, these Porpoise Jaw Oil products STAY at the point of lubrication . . . are non-corrosive . . . resist temperature changes.

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WATCHMAKERS
$1500.00 Contest

Readers want to know what bench problems you have solved, what tools you have devised in order to make a particular job easier, etc.

In order to encourage you to send them in, a $1500.00 contest has been arranged. And, to make it more interesting, there shall be 3 monthly prizes; winners of such NOT to be excluded from final prizes.

CONDITIONS AND RULES

As articles are received, two copies will be made and each entry issued a number which shall appear with article so as to avoid any possiblity of favoritism by Judges. All names shall appear at close of contest.

Articles shall appear at discretion of Judges, Chairman and Editor. All articles become property of THE AMERICAN HOROLOGIST & JEWELER and shall not be returned.

Now is the time to act. Send in one or a dozen articles, practical ideas, experiences, tools or unusual creations. Let's go! 838 prizes more may be added if interest demands.

When sending articles in, mark them for "Contest" or they will not be included.

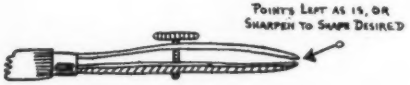
All drawing MUST be in black ink for reproduction purposes. Good drawings command greater attention.

Tool to Hold Pallet Forks And Roller Tables

(Contest Article No. 144)

I have a suggestion to offer that may help others as it helped me:

I was always having trouble to find the right-tool to hold pallet forks and roller tables while I was warming them to melt the cement to secure the roller jewel or pallet stones, also to keep them warm while I made the proper adjustment. The tool that worked out best for me was a draftsman's bow pen as the drawing shows.



DRAFTSMAN'S BOW PEN

I found that the points could be sharpened to any necessary shape desired by the workman. The adjusting screw can be turned to make the points grip the fork or roller table with the proper tension, just as a pair of tweezers might be used. Heat is then applied by alcohol flame just in front of the tension screw. When the cement has melted, the tool can be withdrawn from the flame and any adjustments made with ease, as the wooden handle of the tool stays cool and the metal part will hold heat long enough to complete the job. When the proper adjustment has been made, the tension screw can be loosened quickly or through a piece of cloth and the part placed on the bench where it will cool quickly, allowing the cement to set.

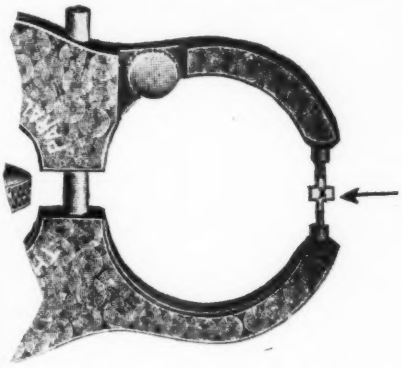
Altering Staffs

(Contest Article No. 147)

Now that we have to alter so many staffs, here is a suggestion that might be of help.

I find some staffs that are so hard a graver won't cut them. I put the staff in the calipers tight, light alcohol lamp, take blow pipe and blow a fine blaze in center of staff at "x" just for two or three seconds.

You can blue the staff without softening the pivots. The calipers will carry the heat away from the pivots.



I have been using this method for several years and find I can do a better job and quicker than trying to even them off with a graver that won't cut them.

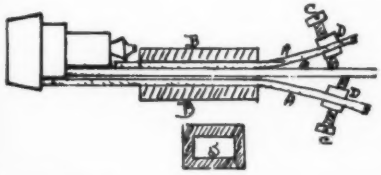
Making a Staff

(Contest Article No. 149)

Here are two ideas which I believe will help make staff work easier, faster and more accurate:

LENGTH

The following illustration shows a tool which is very useful in determining staff lengths and can be easily made.



DIAMETER

The "go" and "no go" method for measuring diameter of staff shoulders can be used effectively on the four to six ligne staffs by using your lathe chucks as measurement tools. Your number two or three (ww) takes the roller table shoulder which is now placed in lathe. Hold the old staff in small chuck pin vise or press it into a ball of beeswax. Use the enclosed tool to obtain the shoulder lengths of old staff. Select a chuck to fit the old hairspring shoulder. The new staff in lathe can now be measured and fitted. (I very often burnish the wheel on at this point instead of using staking tool).

Release tension of chuck in lathe. Place the chuck which you are holding, over the hairspring shoulder and place in lathe, after removing the one in there.

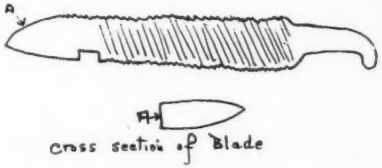
Repeat above instruction to measure and fit the roller table.

I believe the above suggestions will save you a lot of guessing.

Handy Bench Knife

(Contest Article No. 155)

A file, as cut, 45 thousandth thick, sharpened. Cutting else sharped and polished (razor edge).



This is also good to remove hairsprings.

The file part comes in very handy and "A" good for scraper.

I've been using these for many years.

Improving Small Cylinder Movements

(Contest Article No. 158)

It will often happen that particularly small cylinders after running fairly satisfactorily for a year or more will not respond to cleaning and lose hours daily. Yet examination will show that all pivots are in order, as well as mainspring, bushings and pinions. The watch simply refuses to go properly although it seems as perfect as a new one.

Try in this case and go with a fine oilstone over the teeth of the escape wheel, removing the mirror-like polish which has run itself by constantly sliding on the cylinder. The watch will at first go with a scraping noise, which will soon subside, and keep time like a new one. The theory behind this is probably best explained by a comparison: two glass-plates, with oil in between, will stick so hard that it wants force to move them. Two less even surfaces with oil will be easily movable and scraping will be tolerably slight.

Worn Bushings in Unjewelled Or 7-Jewel Watches

(Contest Article No. 159)

Two well-known American makers suffer particularly from bushings which, although not damaging the polish of the pivots, run themselves oval in a short time.

The usual thing watchmakers do if they cannot get the spares, is to chisel the slot round. This brings only a fraction of the area back to bear the pressure, therefore does not last long.

This is my suggestion: As the pressure on the train-bearings constantly exerts itself in exactly one and only that one direction, take the oval bushing out, turn it for 90 or 180 degrees and put it in again. By doing so you have the same pressure-resisting area as if you had inserted a new one. The precision of the position of the respective wheel remains exactly as it was.

To Remove Broken Pivot From Jewel

(Contest Article No. 160)

The following came to my mind today as I had to do it and it might help some of the boys who haven't worked at the bench for over 60 years.

Very frequently when a balance pivot rivets and breaks off if pushed out by main strength and awkardness the jewel breaks; in this case I sharpen a piece of pegwood and dip it in nitric acid and just touch the riveted end of the broken pivot, of course being careful not to let it spread but just in the jewel hole and on the riveted pivot. In about six hours or less the head is eaten off and cleans out O. K.

Try it. Of course all of the OLD watchmakers know this.

Winners for the Month of May Are:

First Prize.....Article No. 150
Second Prize.....Article No. 145
Third Prize.....Article No. 143

Take a look at this wrist-watch PIERPONT!

Modern dials, smart styles, movements of best workmanship, timed thoroughly, prices equivalent to the good quality of the material employed are some advantages of these watches.

Materials for PIERPONT-watches are obtainable rapidly thanks to our well established service for material facilitating your repairs.

Please ask for a Detailed offer to

PIERPONT WATCH CO.
SAUTER FRERES & CO. S. A. BIENNE (SWITZERLAND)

Waterman Company President On Tour of Western Europe

Looking forward to a large expansion of postwar European markets, Frank D. Waterman, Jr., president of the L. E. Waterman Pen Company manufacturers of fountain pens, mechanical pencils and ink, left LeGuardia Field, New York, aboard a TWA Constellation on Saturday, June 29th, for a six weeks' tour of Western Europe.

Before boarding the plane for the flight to London, Mr. Waterman said that he planned to visit agents in England, France and Switzerland during his trip. Meetings with agents from other countries will also be arranged while in Paris and London, he said.

During his six weeks' stay, Mr. Waterman said he hopes to get a good picture of what the future holds in store for American fountain pens in foreign markets.

American Time Representative Opens WatchMaster Studio

Charles Purdom, special representative for American Time Products, Inc., has moved his headquarters from St. Louis to the Hales Building, Oklahoma City, Oklahoma. At his new address, Mr. Purdom will set up a studio and demonstration room where watchmakers from this area may study watchrating by WatchMaster methods. Group meetings will be held at this center at which time advanced rating practices will be demonstrated. Mr. Purdom will also continue his educational work through the mid-west among WatchMaster owners.

New West Coast Representative For Kelbert Watch Company

Kelbert Watch Company, Inc., New York, announces the appointment of Roger S. Ewing as West Coast representative. Mr. Ewing, whose local headquarters will be located at 2250 Green Street in San Francisco, will cover the Kelbert sales territory which includes Northern California, Nevada, Oregon and Washington.

Mr. Ewing is well known in this area, having been associated with A. I. Hall & Son, Inc., San Francisco, for many years.

General Manager of Holzer Company Returns to U. S.

Mr. Julian Holzer, of the Holzer Watch Co., Inc., sole distributors of the TISSOT watches in the United States, has returned from a long stay in Switzerland, visiting the factory and the Swiss Watch Fair.

One of the main results of this visit is the new TISSOT automatic watch in 14 Karat gold and 14 Karat goldfilled domestic cases, one of the thinnest in the world, and with special arrangements for sweep-second which will avoid usual repair complications. The TISSOT automatic is only one of the very fine TISSOT watches to be featured in the new fall line, available to the "400" TISSOT Jewelers.

Present and potential customers of the Holzer Watch Company, will be pleased to learn that the new fall line of the Tissot watches are on display in the showrooms of the firm. Its salesmen, who will be on the road again in September, will have the complete line available. Orders placed at that time will be delivered in time for Christmas business.

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Investigate the training which offers you the most for a lifetime career—a new job or a business of your own. Watchmaking - Jewelry - Engraving interesting, profitable and dignified occupations! Civilian Enrollments Accepted.

Our courses meet the standards of the Veterans Administration and the Vocational Rehabilitation Division of the States of Missouri, Kansas, Oklahoma and Arkansas.

ACCREDITED UNITED HOROLOGICAL ASSOCIATION

K. C. School of Watchmaking

111 EAST 31ST STREET KANSAS CITY 8, MO.

LEARN TO BUY AND SELL JEWELRY AND GEMS

Watchmakers in numerous jewelry firms throughout the country are increasing their earning power or preparing to open their own stores by studying the science of gemstones. They learn to buy and sell more quickly and more efficiently. Ambitious horologists find it worthwhile to complement their own skill with these courses.

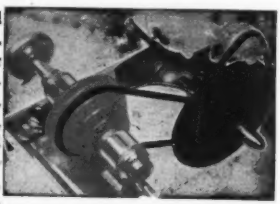
Correspondence courses given by the Gemological Institute of America embrace a broad and scientific study of diamonds and colored stones, jewelry, precious metals and the grading and identification of gemstones. In addition to invaluable scientific information, material in these courses includes profit-making sales technique.

Further information may be obtained from:

Gemological Institute of America

(United States and Canada)
A Non-Profit Educational Institution
541 South Alexandria Los Angeles 5

COMBINATION MOTOR MOUNT AND COUNTER SHAFT



24 speed and power changes. Endless rubber belts are always intact. No vibration. Chrome plated makes nice appearing bench. A pleasure to use and a time saver. Sold by Material dealers everywhere.

Price Only $9.50

LEO TOUSSAINT
Manufacturer
84 Park Ave. Long Beach 3, Calif.

Mention Size and Make of Motor

I. D. Watch Case Executives Return From Service

Hy Dinstman, after three years with the Army Air Forces, has returned to I. D. Watch Case Company, Jamaica, L. I., as head of the Engineering Department. Joseph Dinstman, back from service with the armed forces in Japan, has resumed his executive duties with the firm.

Hy Dinstman

Joseph Dinstman

I. D. Watch Case Company is building a new and larger factory which will be air-conditioned and incorporate all of the most modern features in its design, construction and equipment.

Practice Already Discontinued Subject of FTC Complaint

The Federal Trade Commission complaint against the quantity discount plan of Jacques Kreisler Manufacturing Corporation, North Bergen, New Jersey, came as a surprise to the company. Acting on a request from the Commission, late last year, Kreisler had discontinued the policy, affective January 1, 1946.

The plan had involved a sliding scale of discounts applied against annual purchases of Kreisler merchandise by retail jewelers.

Mr. Tobias Stern, Vice-President of the company, pointed out that the price differential resulting from the discount plan had been applied entirely in good faith and in keeping with the company's policy of close cooperation with its customers.

"Although we believe and still believe that our price differential was permissable and proper," Mr. Stern declared, "We discontinued the plan on January 1, 1946. The Commission and all of our customers were notified of this action at that time."

"In view of the circumstances, we are at a loss to understand the issuance of a formal complaint by the Commission now," Mr. Stern said.

New Manager of INCO'S Sales Department Appointed

The appointment of Walter C. Kerrigan as manager of the Nickel Sales Department of the International Nickel Company, Inc., to succeed the late Rudolph L. Suhl, has been announced by Dr. John F. Thompson, executive vice-president of the company.

Mr. Kerrigan has been associated with business in metals and ores since 1919. He joined International Nickel in 1930 and has been an assistant manager of its Nickel Sales Department since January, 1933. During World War I. he served in the U. S. Navy.

New Radio Show 'Juvenile Jury' Promotes Harman Watches

Harman Watches are being nationally promoted in the new, popular Mutual Network radio show "Juvenile Jury" broadcast every Saturday night at 8:30 Eastern Daylight Saving Time over 317 stations. The show attracted an immense audience from the first broadcast and has been publicized in national newsmagazines and newspapers.

Thousands of listeners are now writing in weekly to compete for Harman Watches which are being awarded to the winning contestants. On the program, typical problem cases are sent in by listeners all over the country to a "jury" of five children. The jurors discuss the cases, give their individual opinions as to how they should be solved and finally arrive at a decision.

A. A. Harman, president of the Harman Watch Company, has taken a personal interest in the program, praising "Juvenile Jury" as an admirable and effective method by which children seek to solve the most common juvenile problems themselves.

Maryland Jeweler to Receive G. I. A. Instruction

Mr. C. Noble Lednum, of Lednum's Jewelers, Cambridge, Maryland left for Los Angeles, California, July 14, 1946 via Trans-World Airlines, for a four week's resident instruction in Gem Testing Institutes at the Gemological Institute of America, preparatory to setting up his own gem laboratory in Cambridge.

Mr. Lednum has received his Associate Membership in the American Gem Society and has completed the work necessary for the title, "Registered Jeweler American Gem Society." Since February, he has been doing work in Advanced Gemology, the completion of which will lead to the title of Certified Gemologist.

Set of 8
JEWEL SCREW DRIVERS
• Brass Knurled Handles
• Hexagon Heads
• Finest Tempered Steel Blade. No. 2, 3, 4, 5, 6, 7, 8, 9
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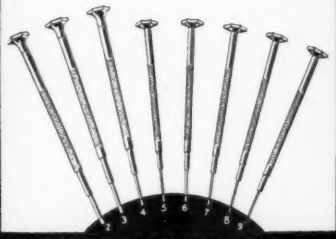
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(Please enclose old movement of the replacement required)
We do not have catalog at present. Write for estimate.
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Optical Instruments Undergo Price Boost

For the second time since the end of the war optical manufacturers have boosted prices. The latest raise of twenty per-cent marks a fifty per-cent raise in the cost of their products, which applies arbitrarily to all orders, even those placed **before** the war. Because of this situation the price of Diamondscopes, raised thirty per-cent last fall, has advanced an additional twenty per-cent with Standard Diamondscopes now selling for $379 and the Bausch and Lomb Basic Diamondscope for $280. B and L has advanced it hand loupe still more, from $6.50 to $12.00.

G.I.A. instrument prices remain as before except where they have been forced upward by the higher cost of material. The Polariscope, notably, is still $19.50 and the Standard Diamolite $37.50. The G.I.A. Eye Loupe has advanced from $12.50 to $15.00, and its special Hand Loupe from $9.00 to $13.50 but even these prices are not guaranteed.

National Instrumentation Conference and Exhibit

Organization of the First National Instrumentation Conference and Exhibit, sponored by The Instrument Society of America, is now practically completed. All sessions of the Conference and Exhibit will be held on the 17th Floor of the Wm. Penn Hotel, Pittsburgh, Pennsylvania, September 16-20, 1946. Fourteen sessions of the Conference have been scheduled by the Instrument Society of America and three sessions have been arranged by the Instruments and Regulators Division of the American Society of Mechanical Engineers.

Over ninety leading instrument manufacturers have already engaged space and the remaining space will be exhausted in the very near future. Attendance at the Conference and Exhibit will be restricted to holders of special invitations. Invitations can be obtained from the Secretary, Instrument Society of America, 1117 Wolfendale Street, Pittsburgh 12, Pennsylvania.

Watch Crystal Company Reorganizing

The California Watch Crystal Mfg. Company of San Diego. California, is now in the process of re-organization, to produce on a larger scale its watch crystal blanks and New Watch Crystal Grinding Machines. It is catering exclusively to Jobbers and Wholesalers.

For full information, contact H. B. Fallowfield, Sales Manager, California Watch Crystal Mfg. Company, San Diego, California.

John Barton Morris Becomes Helbros Sales Manager

Major John Barton Morris, recently of the Army Air Forces, has been appointed sales manager of the Helbros Watch Company, it was announced by Mr. William Helbein, president of that company.

John Barton Morris
Sales Manager
Helbros Watch Company

Before entering the Army Air Forces, Major Morris was in charge of the national sales force of the Eagle Pencil Company of New York. He had served that company as a salesman and sales executive. Major Morris brings to his new duties a practical understanding of the problems of salesmen and retailers as well as a sound academic background based on graduate courses in business administration at Columbia and Northwestern universities. Major Morris demonstrated his mental and physical stamina while at Harvard, where he distinguished himself earning the Phi Beta Kappa key and, at the same time, played outstanding basketball on the Harvard Varsity team.

Major Morris, 36, is a native of New York City. He's back in industry again after having completed four years with the Air Forces, starting as second lieutenant and emerging as major. It is predicted the jewelry trade will see much of Major Morris and will appreciate his cooperative manner.

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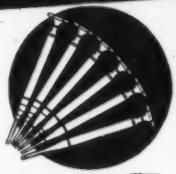

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Date of A. G. S. Conference Changed

Due to the ANRJA Convention being advanced to August 12th through 15th, the one-day Midyear Conference of the A.G.S. in New York City has been changed to Friday, August 16th. The meeting will still be in the Sert Room of the Waldorf-Astoria. **If you plan to attend and haven't yet notified Headquarters,** please do so right away.

Reason for the Convention's change of date: the government's priority reservation for accommodations for 8,000 United Nations personnel, starting August 20.

Your room reservations should be changed (or made) immediately, if you plan to go at all! Certain hotels in the vicinity of the Waldorf-Astoria have set aside rooms for the use of ANRJA members. Among these hotels are: Barclay, Belmont Plaza, Biltmore, Commodore, Lexington, Roosevelt, Shelton and Sheraton.

Longines Symphonette to Entertain ANRJA

A high spot planned for the members of the American National Retail Jewelers Association meeting in Convention in New York on August 12th through 15th, is a concert by the famed Longines Symphonette, "radio's finest orchestra," at Carnegie Hall, on the evening of August 14th, which is being presented with the compliments of the Longines-Wittnauer Watch Company.

The Symphonette, a group of 55 of the top-flight musicians of New York, Philadelphia, and Boston, with Mishel Piastro as conductor, will present a Gala Pop Concert of orchestral music—especially selected for summer evening entertainment.

The featured soloist of the evening will be Joseph Fuchs, eminent violinist, who has won the enthusiastic praise of critics in his concert appearances with leading orchestras and in recitals all over the country.

Vacation Notice!

F. W. Derbyshire, Inc., Waltham 54, Massachusetts, announces that its shop—factory and offices—will be closed for two weeks starting July 28 and ending August 10th. Shipments and mail will not be received during that period.

Elgin National Watch Company 1936-1945 Report

Elgin, Illinois.—Elgin National Watch Company spent almost 69 million dollars in the Elgin community in wages, salaries, awards, employee benefits, taxes and philanthropy during the 1936-1945 decade.

This impressive sum, which would pay for the education of 40,000 Elgin children from their first grade through public high school, was obtained from records in the offices of John M. Biggins, secretary and treasurer of the watch manufacturing company.

An additional amount of $5,518,000 has been contributed by the watch company to its Employee Pension and Relief Funds, established respectively in 1918 and 1919.

Waterman Company Announces Management Changes

NEW YORK—Important changes in the higher management of the L. E. Waterman Pen Company, of New York, providing for greater expansion of production and research facilities, were announced by Fred S. Waterman, vice-president in charge of manufacturing.

Edward R. Wegenhals, formerly assistant manager of the Radio Receiving Tube Division at RCA's Harrison, N. J., plant, has been appointed to the newly created post of production manager, while Henry N. Briechle, formerly plant superintendent, has been named chief engineer in charge of plant engineering, research and new product development, Mr. Waterman disclosed.

Under this new set-up, the title of plant superintendent has been abolished and the operations formerly combined under his jurisdiction have been split up, with the production manager and chief engineer taking over these duties.

Mr. Wagenhals, who will supervise all factory production, is a graduate of Dennison University, in Ohio, where he received his B. S. Degree in Chemistry in 1927. Shortly after graduating from college, he got a job at the Harrison RCA plant, at that time part of General Electric, and had been with the company until he left to accept the position at Waterman's.

Mr. Briechle, a graduate of Rutgers University, came to the company in 1923, starting as a draftsman in the plant. During his 23 years at Waterman's he personally designed and developed many of the tools and dies which are used in the manufacture of the pens.

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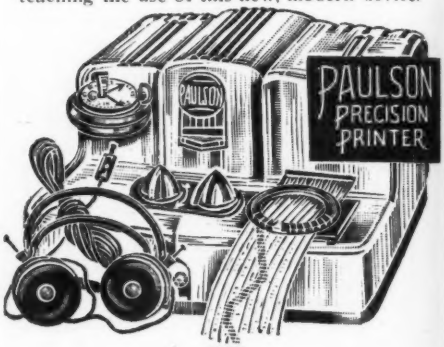
Paulson Company Celebrates Watch-Timer's 15th Year

1932

INTRODUCED FIRST ELECTRONIC WATCH TIMING DEVICE. This machine was the marvel of its time. Because of fluctuations in the regular 60-cycle current, and because this machine was sensitive to these fluctuations, it was necessary to make comparisons with a master watch, and at the same time check the fluctuations in the alternating current, so as to make allowances for these fluctuations and allowances for the fast or slow rating of the master watch.

While this usually required careful demonstration to each watchmaker, in order to learn how to handle the machine, the machine was very successful. It was demonstrated first in Cincinnati at the National Retail Jewelers' Convention, and thereafter throughout the country. Paulsons spent thousands of dollars demonstrating and teaching the use of this new, modern device.



1935

AFTER TRYING TUNING FORKS for time comparison and finding them both expensive and not dependable, Paulson introduced the first Watch-Timer using a master watch, where the fluctuations in the alternating current were of no concern. This machine was so made that with every tick of the master watch a magnetic control moved the dial forward or backward to compensate for the flucuations in the alternating current. This revolving dial was connected by a loose coupling to the motor, and thus, the regulation could be handled perfectly, but there was still the master watch, with its variations in rating to consider. For in checking ratings for watches, the watchmaker had to know how fast or slow his master watch was in order to get a correct rating.

1940

QUARTZ CRYSTAL PROVES THE CORRECT ANSWER. The famous Model F Watch-Timer with crystal control for time comparison was introduced. Here, at

last, was a time comparison that was infallible. Here was a time comparison that did not change, that needed no check for fluctuations, that needed no master watch. The quartz crystal used to regulate the revolutions of the dial in the watch-timer did not vary in its control, thus assuring accurate time for comparison. It enabled watchmakers to save more time, to speed up their work, and they were assured of correct answers from correct time comparison.

This crystal control is the same as used on all time-control scientific instruments today. It is the means by which radio broadcasting is controlled, and it is used in the world's great accurate time centers, including Greenwich and the U. S. Naval Observatory.

1946

NOW, THE NEWEST CRYSTAL-CONTROLED WATCH TIMER, PAULSON PRECISION PRINTER, with continuous tape for recording. This marvelous machine, the result of 15 years of constant effort in making timing machines, is the greatest forward step offered the watchmaker in the last decade. Here is accuracy, speed of operation, perfect control, a printed record with no change of tape, but continuous recording on watch after watch without effort. Here is a new low cost due to greater efficiency and phenomenal improvements during the last few years.

This instrument, one of the many developments THE PAULSON firm has brought forward following the war years, is the one of which they are most proud.

A. G. S. Elects New Executive Director

At the May meeting of the Board of Directors of the American Gem Society, members of the Board regretfully voted acceptance of Robert M. Shipley's resignation from the office of Executive Director of the A. G. S., and elected Mrs. Dorothy L. Phebus, formerly Assistant Executive Director of the Society, now returned to the staff, to serve until the next annual meeting of the Board.

Mr. Shipley's resignation closes a twelve-year, unusually active association of invaluable benefit to the Society through his direction of its affairs from 1934, when he founded the organization. Although he remains on call in an advisory capacity, his resignation enables him to devote his major attention to the educational interests of gemology through his office of Executive Director of the Gemological Institute of America.

Mrs. Phebus became well known to the A.G.S. membership through her four years as Executive Secretary of the Society and during the period in which she served as Assistant Executive Director.

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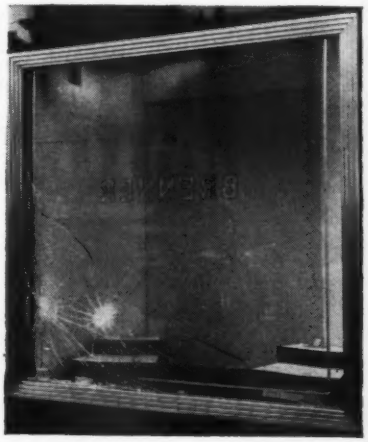
Safety Glass Prevents Jewelry Robbery

Value of safety glass for protection of jewelry stores was proven recently in an attempted robbery of the Brenner Jewelry Store, 200 West Federal Street, Youngstown, Ohio.

The store window is unusual in construction. It consists of a double glazed unit. The exterior is a sheet of standard plate glass. Four inches back from this is a unit of Duplate Safety glass. The transparency of both glasses is so perfect that to the casual observer they seem to be only one plate.



So they must have appeared to the thief attempting to burglarize the Brenner shop. After using a large brick to smash the exterior plate glass panel he was stopped by the safety glass. Repeated smashing on this glass did not break it.

When he broke the exterior plate glass panel an alarm went off bringing protection men post-haste. They arrived on the scene while the would-be burglar was still vainly pounding the safety glass. Although he had managed to crack the Duplate safety glass, the protective surface had not been broken and the attempted burglary had been foiled.

The inner protective safety glass which proved 100 per cent effective in its purpose is three-ply safety Duplate manufactured by the Pittsburgh Plate Glass Company. It is composed of two thicknesses of ⅛-inch plate on the outer surfaces and one thickness of ¼-inch plate in the center laminated by vinal plastic of extra heavy gauge. This glass has been especially designed for protection of jewelry stores and similar establishments.

Post-War Program of Jewelry Board Reviewed in Newark

The largest number of jewelry product manufacturers, importers and wholesalers, located in Northern New Jersey, ever gathered together in the history of the industry, met in Newark, N. J., on June 11, 1946, at the Essex House.

The meeting, held under the auspices of the Newark Committee of the Jewelry Industry Publicity Board, was called for the express purpose of reviewing the post-war program of that board.

Members of the Newark Committee responsible for the meeting were Charles Church, Church and Company; H. Monroe Larter, Larter & Sons; Leonard Shiman, Shiman Mfg. Co., Inc.; Horace Garrigus, Garrigus & Co.; Charles Mealy, Forstner Chain Co.; Arthur Steller, Allsopp-Steller Co., and Thomas Tierney, Krementz & Co.

Mr. Larter presided at the meeting. The presentation of the Jewlery Industry Publicity Board's retail sales promotion program—a program that aims to help keep retail sales at high levels—was made by the Board's chairman, Mr. W. Waters Schwab.

East Boston Airport Timed By Waltham

Officially chosen to time the new Logan International Airport, East Boston, Massachusetts, the Waltham Watch Company has installed a score of synchronous clocks at every vantage point in the new airport buildings. "Waltham Watch Time" is etched in a metal ring encircling each clock.

Timing more airlines than all other watches combined, Waltham has now added the Logan International Airport in its campaign to make the air traveler aware of the accuracy and dependability of Waltham Watches.

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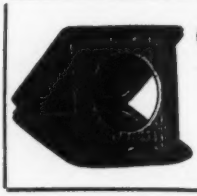
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CPA Report on Tin Conservation

The Civilian Production Administration today advised manufacturers of jewelry and other novelty and luxury items that they must continue to be guided by the restrictions of the tin conservation order (M-43) in their output of these products.

Jewelry manufactured from tin has appeared in constantly increasing quantities in many retail stores since V-J Day, the agency said. Many wholesalers and retailers seem to be under the impression that CPA Order M-43 has been withdrawn or relaxed. Tin conservation is still a "must" item, CPA emphasized, and Order M-43 remains in full force and will continue effective until the tin situation eases.

CPA said that the use of any metal containing 1½ per cent or more of tin is prohibited in the manufacture of jewelry, buttons, novelties and ornamental articles. Manufacturers, wholesalers, jobbers or retailers may not buy or sell such articles containing tin unless the seller has authorization from the Civilian Production Administration to sell the particular item offered.

The Compliance Division of the Civilian Production Administration is investigating this situation.

Contributing to the trade perplexities regarding the tin situation are the stories that have appeared recently in some magazines to the effect that information received from Washington indicates that the improved tin supply will make possible the use of white metal by manufacturers for the production of tin-containing jewelry.

C. & E. Marshall Co. Operates On 40 Hour - 5 Day Week

In order to give its employees an entire week end in which to relax and enjoy their favorite sports and hobbies, the C. & E. Marshall Co. is now operating on a 40-hour, 5-day week basis. Along with the shorter work week, employees receive the same salaries as on the longer week basis, which means a 30 per cent increase for male employees and a 15 per cent increase for female employees, who work a shorter week. Factory employees are now operating on a 47-hour schedule, instead of the 57-hour schedule maintained during the war. The entire company operated on a longer schedule during the war in order to fulfill their commitments of tools to the United States government . . . tools used by the government throughout the world. And also to supply their old and valued customers as efficiently as before the war. Now the company believes their employees have earned the opportunity of enjoying each week end as a vacation.

New G. I. A. Glossary Will Aid Entire Industry

"What is meant by 'split prong'?" "What are 'curb link chains'?" These and other questions, bothersome when asked of experienced jewelers or jewelry salesmen, often are posed by newer employees in the industry.

To help proprietors and employees expedite business G.I.A. is compiling a glossary including answers to these questions as well as general information on retailing. The glossary, however, will help not only the beginner; material will be so inclusive it will broaden the knowledge of everyone in the industry.

Alma Service Company Offers Extensive Repair Service

One of the greatest worries of a busy jeweler is piled up repair jobs waiting to be done. Naturally, he wants to accommodate his customers, but not by cutting in on the valuable time he should devote to making sales.

Al B. Greenberg, manager of a jewelry chain, recognized the great need for an outfit that could competently handle all a jeweler's repair jobs for him—yet leave him plenty of room for profit on these jobs. In March of 1944, he set up a "jeweler's service station" in a loft on the Bowery in lower New York. Starting with three employees, today he has twenty-four repair experts working continuously on the many common and unusual repair jobs that come into his shop. On his staff are six skilled watchmakers—trained in Czechoslovakia, Belgium, Switzerland and America, a diamond setter, a hammer setter, two jewelers and an engraver, besides a plater, polisher, and silversmith. In his office, Mr. Greenberg employes two secretaries, a shipping clerk, and three runners, whose job it is to go around the city seeking hard-to-get materials.

In addition to the usual watch repair work, the firm handles many unusual jobs, ranging from repair jobs on electric percolators and silverware to those on valuable antiques and perhaps a $40,000 diamond bracelet.

Alma boasts that nothing is impossible, and will undertake to repair anything, large or small. This often results in a greater expenditure of time and work—particularly in locating rare and hard-to-find parts—than they can logically charge for the job in question. But Mr. Greenberg has found that it pays out in customer confidence that Alma can indeed do anything.

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The L & R Demagnetizer is in stock at all material jobbers. Many other new L & R items are on the way and will be announced soon.

$30,000,000 Correction!

In the summary of the Hamilton Watch Company's 1945 Annual Report, on Page 45 of the April issue of the American Horologist, it was stated that Railroad Watches (authorized by WPB Order No. L-175) produced by the Hamilton Company

during 1945, amounted to $31,528,597.44. Actually, the Railroad Watches produced by Hamilton in 1945, amounted to $1,862,511.64.

We regret to say, that while preparing that part of the summary, our eyes dropped down a line too far, and the figure we quoted constituted the *total* amount of war work produced by the Hamilton Watch Company.

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Can handle 25 to 30 watches per week. All work guaranteed—estimates free. One week to ten days Service. Reference and prices upon request. Russell B. Dearolph, Jeweler, Parker's Landing, Pennsylvania.

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Exceptionally fine watch repairing by our staff of competent watchmakers. Prompt, efficient, and dependable service. Watches precision timed on WatchMaster. Price list on request. The Harr Watch Repair Company, 545 Fifth Avenue, New York City.

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Due to expansion, we are open for additional accounts for the trade. All work guaranteed. Mail orders our specialty. Regulated Time Service, 1508 Charlotte St., Bronx 60, New York, N. Y.

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We are able to give you close timing and prompt service on all watch and clock repairs. Price list upon request. AMARILLO WATCH AND CLOCK REPAIR SHOP, Rms. 24-26 Johnson Bldg., Amarillo, Texas.

Expansion of shop facilities enables me to handle a few more accounts. Only good work is solicited. Standard prices, reasonable service, all work guaranteed. A trial will convince you. References and prices upon request. W. L. Montgomery, Room 718 Chester Williams Building, 215 West 5th Street, Los Angeles 13, Calif.

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Let us convince you that this praise is justified.

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Town 2500 population. Good business, new fixtures, complete jewelry stock. Located near large oilfield. Cheap rent including living rooms in rear. No competitors. A rare chance. Must change climate for health. Located Central Illinois. Box 611, c/o The American Horologist & Jeweler.

Will sell my store $10,000 fixtures and stock. Easily pay out in two years. In the heart of Rocky Mountain fishing and hunting district. Write Box 608, c/o The American Horologist & Jeweler.

FOR LEASE
Country Home and Watch Shop

On account of ill health, I am leasing one acre with a modern six room house including shop, garage, small orchard, garden and large yard.
The watch repairs average nearly $400.00 a month. I have a small stock and fixtures which will cost less than $1,000.00
I will lease this for $75.00 a month. This location is 70 miles east of Los Angeles, 10 miles southeast of Redlands, and 4 miles southwest of Yucaipa on Highway 99.
Daniel Webster, Yucaipa, California, Rt. 1, Box 121.

ARTICLES FOR SALE

Automatic Engraver made by Auto Engraver, New York City, Cost Complete $700.00. Sell for $300.00. A. J. Petrelli, 286 E. Dominich St., Rome, N. Y.

Fine quality rebuilt watches in new attractive cases ready to sell. Order with confidence from F. Stern, Box 43, Station W., New York 24.

HOROLOGICAL BOOKS

of every description for sale. Send for catalogue or state your wants. H. Birnbaum, 218 East 59th Street, New York.

ARTICLES FOR SALE (Cont.)

Now available assortment 12 wheel cutters $36.00 set. Send sample cutter or wheel for special sizes. Also WW No. 2 adjustable arbors to take any cutter 4 to 5 mm hole. R. P. Gallien, 220 West 5th Street, Los Angeles 13, California.

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5 Elgin, Waltham, Illinois or Hampden 18 size movements for material, $10.00. Three 12, 16 or 0 size, $10.00. B. Lowe, Holland Bldg., St. Louis 1, Missouri.

FOR SALE

Used Pocket Watches, Wrist Watches. American & Swiss Pocket Watch & Swiss Watch Movements for Rebuilding. M. Presant, 4421 N. Sheridan Rd., Chicago 40, Illinois.

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16 Swiss wrist-watch movements suitable only for material, $10.00. One dozen new chrome 10½L, 6½L, 6¾L cases, $5.00. B. Lowe, Holland Bldg., St. Louis 1, Missouri.

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New and Used Wheel-Cutters; Slide-Rests, Lathes and Attachments. Cash paid for Used Watchmakers' Lathes and Attachments. R. P. "Dick" Gallien, 220 W. 5th St., Los Angeles, Calif.

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Keys for key winding watches ½ doz. assortment $2.50 (limit ½ doz. to customer.) Assorted Round Gold Filled Bows $2.95 doz. Antique Pocket Watch Crowns $4.00 dozen. N. Y. Standard Mainsprings $2.50 dozen. Special combination offer includes ¼ dozen keys, 1 doz. Bows, Crowns and Mainsprings all for $9.00. Send check or Money Order for Prompt Delivery Post Paid, Dept. H-B, Sawco, 11 W. 42nd St., New York City.

Watch materials, Swiss staffs and stems $1.00 four. Buy only Swiss Onyx-steel mainsprings $1.00 four, $2.60 doz. Finest Balance hole jewels 100 asst. $12.00. Genuine Dumont tweezers $3.50, others $2.00 E-Z pivot polisher $1.00 four. B & M hairspring vise $4.50.
Pellets with arbors, escapewheels, balance wheels complete $1.50 to $4.50.
Mail orders promptly.
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Watch-Motor Mainspring Co., Inc. ..... Front Cover

TIME *for* HUMOR

The Cad!

It was the second week of their engagement and they sat before the cozy fire planning their future life and dreaming of their happiness. He was fondling her left hand and twisting the gorgeous diamond ring with which they had plighted their troth. As he was admiring the gleaming fiery gem, he asked: "Tell me, dear, has anyone remarked about your engagement ring? Have your friends admired it?"

"Why, yes, dear," she answered. "Two of them not only admired it, but recognized it!"

A wedding ring may not be as tight as a tourniquet, but it certainly stops the wearer's circulation!

Highway Robbery!

A man who was motoring along the highway offered a stranger a lift. The stranger accepted. Shortly afterward the motorist noticed that his watch was missing.

Whipping out a revolver which he happened to be carrying, he dug it into the other man's ribs and exclaimed: "Hand over that watch!"

The stranger meekly complied before allowing himself to be booted out of the car. When the motorist returned home he was greeted by his wife.

"How did you get on without your watch?" she asked. "I suppose you know that you left it on your dressing-table?"

Well . . . He Asked for It!

Little Dot, age four, was visiting her uncle. She was very fond of playing with his large, open-face watch and heavy gold chain. One day he held the watch by the chain, swinging it back and forth like a pendulum in front of her, and asked:

"Dot, what is it that runs when I run, and runs when I walk, and runs when I stand still?" The answer was obvious.

Quick as a flash she looked up at him and answered, "Your nose!"

"It started with a ringing in the ears!"

"Well, anyway, you do have to admit I made a nice try!"

Lunch Time-Piece

The applicant for a job hauling freight coast-to-coast was asked if he was acquainted with the several time zones.

"Sure am," he replied, "And I'm prepared, too! In my left-hand pocket I carry a watch for Eastern Standard time. In my right-hand pocket I carry a watch for Central time. On my left wrist I carry a watch for Rocky Mountain time. On my right wrist I carry a watch for Pacific Coast time. And in my hip pocket I carry a big old size-18 hunting case!"

"What do you carry that one for?" he was asked.

"My lunch is in it," replied the applicant, "A guy gets hungry keeping track of all those watches!"

—Ted Douglas

"Look, darling, here is a diamond engagement ring for you."

"Oh, it's beautiful. But, Honey, the diamond has a flaw in it!"

"You shouldn't notice that. You're supposed to be in love—and love is blind!"

"Yes—but not stone blind!"

Floor Minutes Past Four!

Junior was playing watchmaker with the grandfather clock in the hall when his mother called from the kitchen, "Junior, what time is it?"

"I don't know exactly, Mom," replied Junior, "The little hand is on four, and the big hand is on the floor."

—Ted Douglas

"I know he's the man for me, Mother. Every time he takes me in his arms, I can hear his heart pounding."

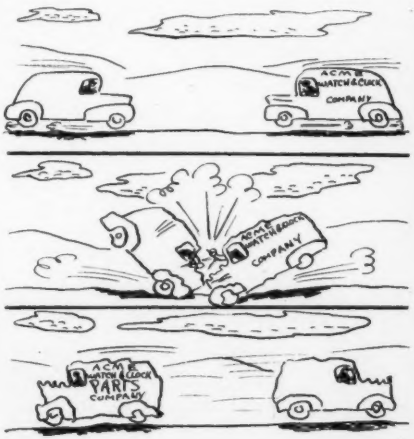
"Better be careful, daughter. When your father was courting me, I was fooled for a year by his dollar watch!"

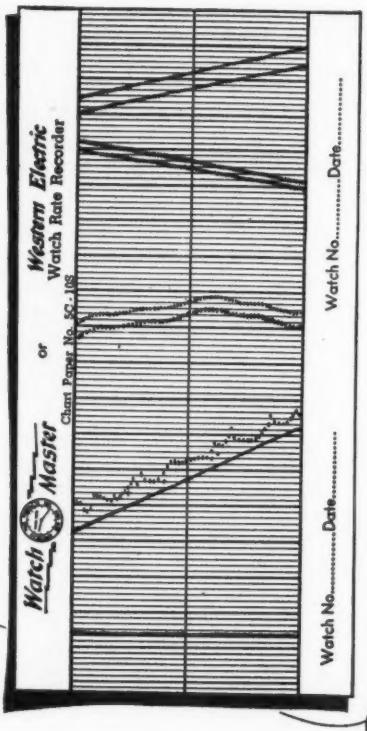
A Losing Battle!

The elevator pilot in an office building grew weary of repeated requests for the time. At last he put up a shelf in the corner of his elevator and placed a small clock on it. That stopped people from asking the time. Now they ask, "Is your clock right?"

"Isn't it time he finished?" the weary pew-holder whispered as the preacher talked on and on.

"Time!" replied his companion, bitterly, "Time!" He's exhausted time and encroached upon eternity!





The "Marks" of Time

Each line on the chart is a printed record of the 24-hour performance of a watch—

- easily read
- quickly analyzed
- compact
- accurate to less than a second a day

MADE IN 30 SECONDS

Watch records, like that above are made on a WatchMaster drum with paper rigidly held in an unshifting position to assure unvarying accuracy.

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Distributors of Western-Electric Watch-rate Recorders